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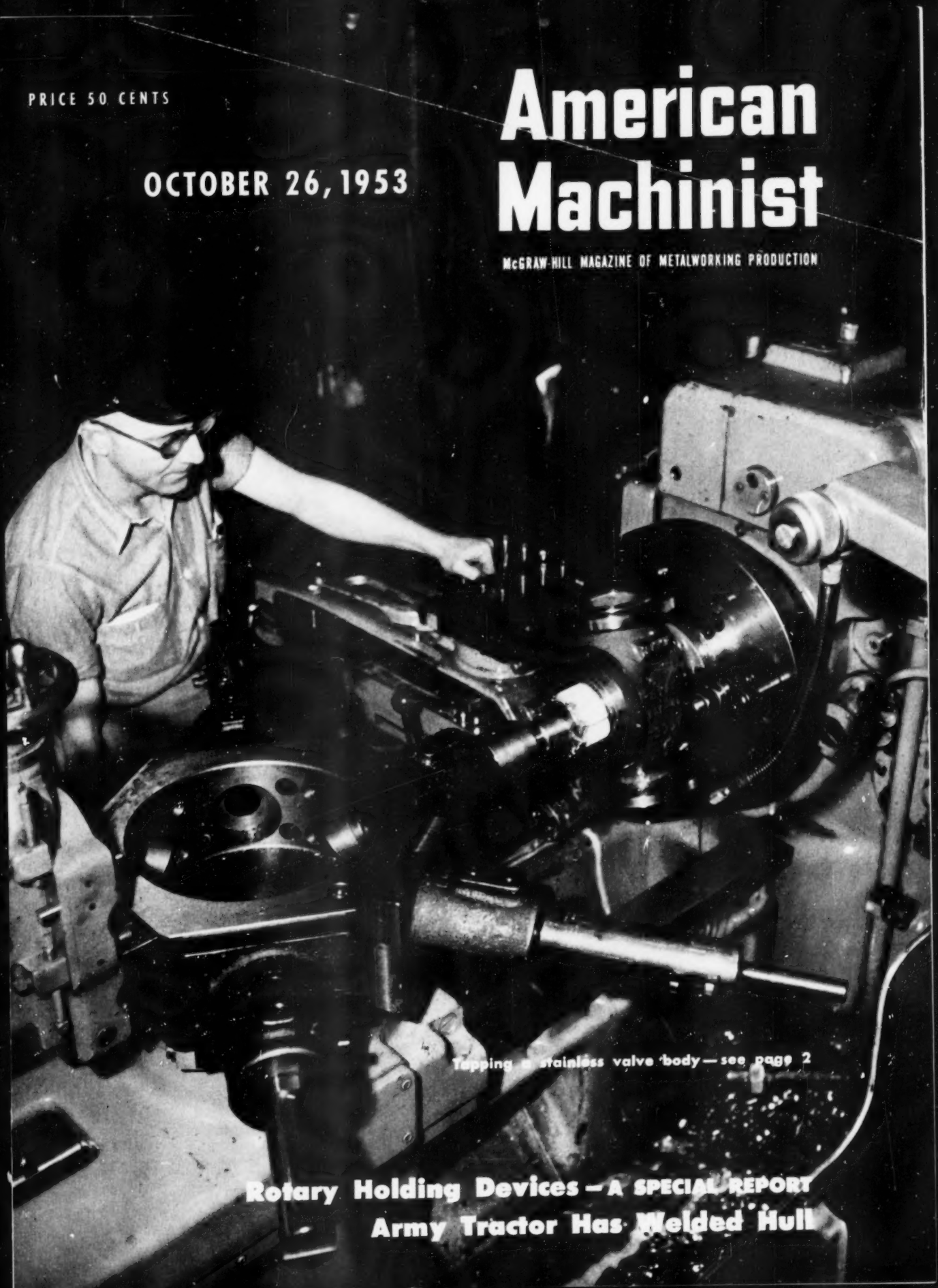
OCTOBER 26, 1953

American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

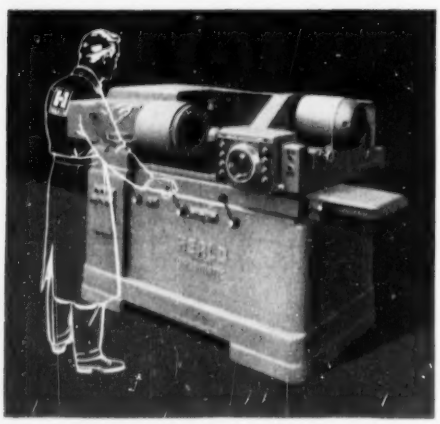


Tapping a stainless valve body—see page 2

Rotary Holding Devices—A SPECIAL REPORT

Army Tractor Has Welded Hull

Heald Internal outproduces older equipment by nearly



This Heald Model 271 Gage-Matic grinds ring gear bores nearly as fast as two older machines.

THIS might be just another case history, except for one thing — a production increase of almost 100 per cent. And that's a pretty important saving in any production man's language.

A Heald Model 271 Gage-Matic was installed by an automotive manufacturer for grinding the bore of differential ring gears. A simple, straightforward operation — yet it was found that this new Internal out-produced *two* older machines by almost two-to-one! Why? Because all of the new Heald machines have been designed to save time and effort on *every phase* of the operating cycle. It all adds up to a substantial increase in production efficiency.

Remember — when it comes to precision finishing, it pays to come to Heald.

Internal and Rotary
Surface Grinding Machines
and Bore-Matics

HEALD

THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION

CONTENTS FOR OCTOBER 26, 1953

VOL 97, NO. 23

ADMINISTRATION

111 EDITORIAL *Burnham Finney*
146 RED BARN + BIG TOOLS = NEW SHOP
147 SUPER SALESMAN *Round Table*

ENGINEERING

119 BOEING DEVELOPED PLASTIC SAVES DIE-FABRICATING TIME
149 FORMULA MEASURES GROOVE WIDTH *M G Terrill*

ASSEMBLY

113 SPECIAL FIXTURES SPEED HULL WELDING *H W Lindsay*
118 MACHINE WELDS POWDER CANS AT 100 IPM *E A Hess*

MATERIAL CUTTING, FORMING

120 WHEN YOU REDRAW SHELLS, OBSERVE RULES *Stanley R Cope*
145 DODGE DOUBLES UP GRINDING ON ROCKER-ARM PADS
150 CUTTING SCREWTHREADS WITHOUT COMPOUND *R T Spinks*
151 MILLING CUTTERS FORM LARGE RADII *Walter Pfeiffer*
151 TINY HOLES WITHOUT SENSITIVE DRILL *Ottavio Cerullo*
152 MICROSWITCHES, AIR PINCH OFF TUBING *Arthur Nelson*
155 BROACH TROUBLESHOOTING *Joseph A Psenka*

MATERIALS HANDLING

124 REFRIGERATORS MOVE FASTER ON CONVEYORS *B E Schroeder*

TOOLING

148 LATHE GENERATES PARABOLIC CHUCKS *Clifford Molloy*
149 CONE GUIDES CENTERING TOOL *N Palmer*
149 FLIPPER EJECTS FLAT PARTS *Lester J Peck*
150 BENCH VISE SERVES AS SCREW PRESS *Federico Strasser*
151 MULTIPLE BENDING FIXTURE SIMPLIFIES WIRING *H G Koslow*
152 TURNBUCKLE "BEEFS UP" DRILLPRESS *Salvatore Architetto*

NEWS OF METALWORKING

97 SPOT NEWS
99 WASHINGTON
101 DETROIT
103 MACHINE TOOLS
107 GAGING METALWORKING
210 NAMES IN THE NEWS

DEPARTMENTS

90 BACKLASH
148 PRACTICAL IDEAS
155 REFERENCE BOOK SHEETS
161 TALKING SHOP
172 EQUIPMENT, MATERIALS, PARTS
177 NEW BULLETINS
198 ROUND TABLE DISCUSSION
236 NEW BOOKS

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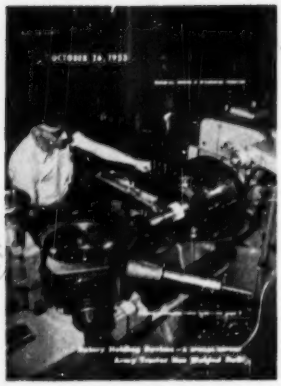
ABC ABP



chips

VALVE TAPPER . . . Fisher Governor Company, Marshalltown, Iowa, has a planned replacement program and a reputation for having some of the most modern equipment in the Midwest. Our cover shows a case in point—a back view of a Gisholt 2L saddle-type turret lathe threading a single-seated, Type 316 stainless valve body. The job is tough—requires a tap with a leader and follower. The machine is less than three years old.

Speaking of replacement, watch for our 1954 Production Planbook, scheduled for publication in the middle of next month—it is jam-packed with replacement and modernization case studies.

WELDING . . . We decided to give you two welding stories this issue —for contrast. Our lead article is the first, wherein H W Lindsay, works manager of Allis-Chalmers at LaPorte, Ind, tells how the boat-like hull of the Army's latest multi-purpose tractor is assembled. Special fixtures have been developed for the job, and are shown in pictures. . . . Second describes an interesting automatic welder for tops and bottoms of square cans with round corners. The cans are for powder, and the story is told by E A Hess of Lincoln Electric.

HOLD IT . . . Everybody knows you have to have proper equipment for holding work on a machine tool, but not everybody knows how many different holding devices are available. In this issue's Special Report, Associate Editor "Jim" Linsley has compiled a collection of the various types employed for holding rotating work, and tells how they operate. In a subsequent Report he will show those available for holding non-rotating work.

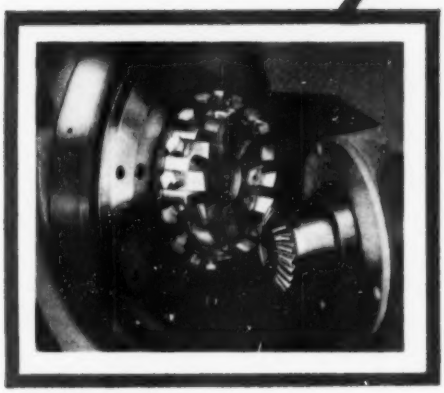
10 MILES OF CONVEYORS . . . Hotpoint has just opened a million-square-foot plant for the manufacture of refrigerators. B E Schroeder of the company gives us the first description. Major feature is 10 miles of conveyor line—manual handling and trucking of components are out. The pictures and captions will show you a number of other new ideas.

BARN . . . News reports tell of the absorption of small plants by big ones, but we have a story of a little plant with a big idea. It's in a red warehouse 'way up in New Hampshire, but has the biggest machine tools for miles around. Result: plenty of business. Also, there's no overhead and no trimmings—everybody and everything works. The story is in a page of pictures. . . . There's also a page showing a new Dodge idea, wherein 64 fixtures on one grinder hold rocker arms for a pad-grinding operation. Four of these special grinders keep up with output of 2400 engines per day.

COMING . . . *AM* for Nov 9 will include a Special Report on Apprentice Training, 16 pages of the latest on the subject. Our lead article will describe manufacture of parts for precision Hawk-Eye camera lenses—a recently mechanized job. There'll be other articles on pantograph milling, on grinding master involutes, on bore grinding in big guns, on tumbling, and several shorter articles, plus an additional instalment of Stanley Cope on draw dies.

HULL MAKER . . . H W Lindsay has been works manager at the La Porte, Ind, Works, Tractor Div, Allis-Chalmers Mfg Co, for the past eleven years. Plant products are grain and corn harvesting, forage and hay machinery in addition to defense work. Included in the latter is the M-8 cargo tractor, hull welding on which is the subject of our lead article. Mr Lindsay was an engineer on highway work for 16 years, then joined A-C in 1935 as manager of the Grader Dept, then located at la Porte, now at Springfield, Ill.

NEW NO. 106 HYPOID GENERATOR



This tractor belt pulley drive gear, 25 teeth, 7 D P, 11/16" face, 8620 steel, is completed in one operation at 14.6 sec. per tooth, 5.8 min. floor-to-floor time.

. . . For cutting spiral bevel, ZEROL® bevel, and hypoid gears up to 4 D P, 8½" diameter, 1¼" face

This versatile machine is ideal for small quantities or mass production of gears in the above size range. Greatly increased production rates are assured, because of its improved features, including cam-actuated generating motion, and rigid new-type cutter spindle construction. Many gears which previously required separate roughing and finishing cuts can now be completed in one operation, with marked savings in floor-to-floor time and handling time per piece.

Send prints of your bevel gears for an analysis of the cost savings this new generator can offer you.

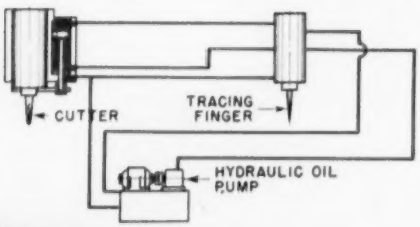
GLEASON

GLEASON WORKS

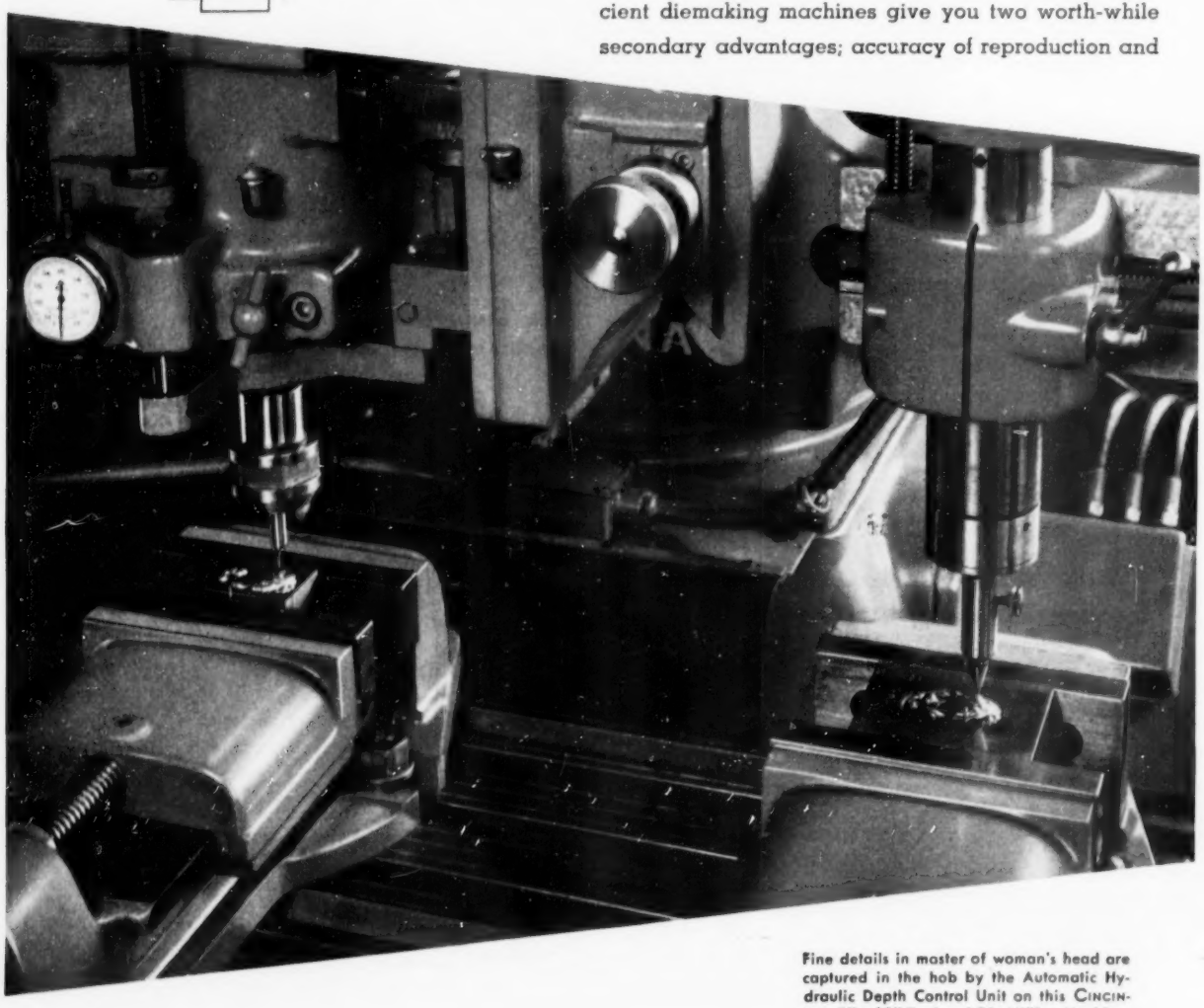
BUILDERS OF BEVEL GEAR MACHINERY FOR OVER 85 YEARS

1000 UNIVERSITY AVE. · ROCHESTER 3, NEW YORK

Automatic Sculpturing



Have you ever tried sculpturing? It's slow, tedious work, and a slight miscue near the finish can spoil days or weeks of painstaking labor. "Sculptors" of metal—America's diemakers—have the same regard and pride for their work as sculptors in stone. But they have one big advantage over their more arty brethren . . . they can employ *automatic tracing* over a master to reproduce minute details much faster and more accurately than could ever be done manually. CINCINNATI 8" x 18" Tool and Die Millers are equipped for this type of work; *automatic, sensitive tracing* through the Automatic Hydraulic Depth Control Unit. There's no chance for a miscue at any time, not even if the cutter breaks. The operator merely rotates the table or cross traverse handwheel, while the automatic unit takes care of the vertical movement of the cutter to form the die cavity or profile. ¶ These efficient diemaking machines give you two worth-while secondary advantages; accuracy of reproduction and

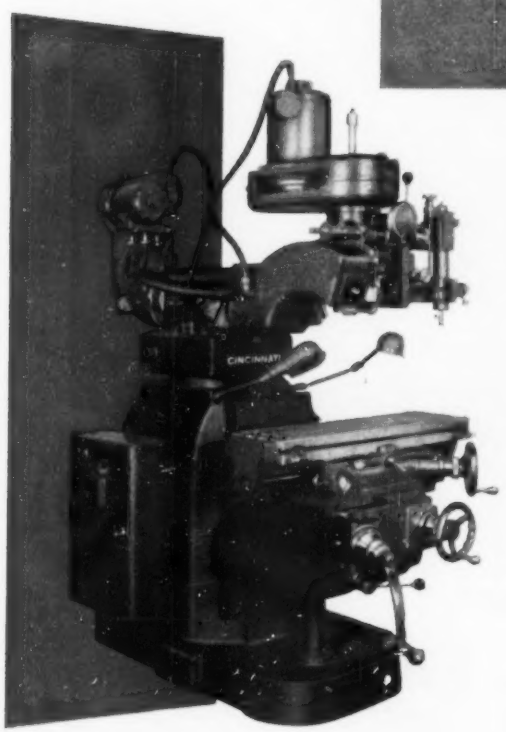


Fine details in master of woman's head are captured in the hob by the Automatic Hydraulic Depth Control Unit on this CINCINNATI 8" x 18" Tool and Die Milling Machine.

quality of finish are so good that subsequent hand finishing is cut way down. ¶Does the CINCINNATI 8"x18" Tool and Die Miller sound like a candidate for the first team in your shop? These machines are your best buy for producing accurate, low-cost molds, hobs and dies, from the size of those illustrated here to larger ones up to an area of 8" x 18". Catalog No. M-1731 gives you a better indication of their possibilities. Brief specs. in Sweet's Machine Tool Catalog.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

Expertly sculptured in metal by the deft touch of the tracing finger on a CINCINNATI 8" x 18" Tool and Die Miller. Above, woman's head hob . . . left, toy horse hob . . . below, Indian head embossing die.

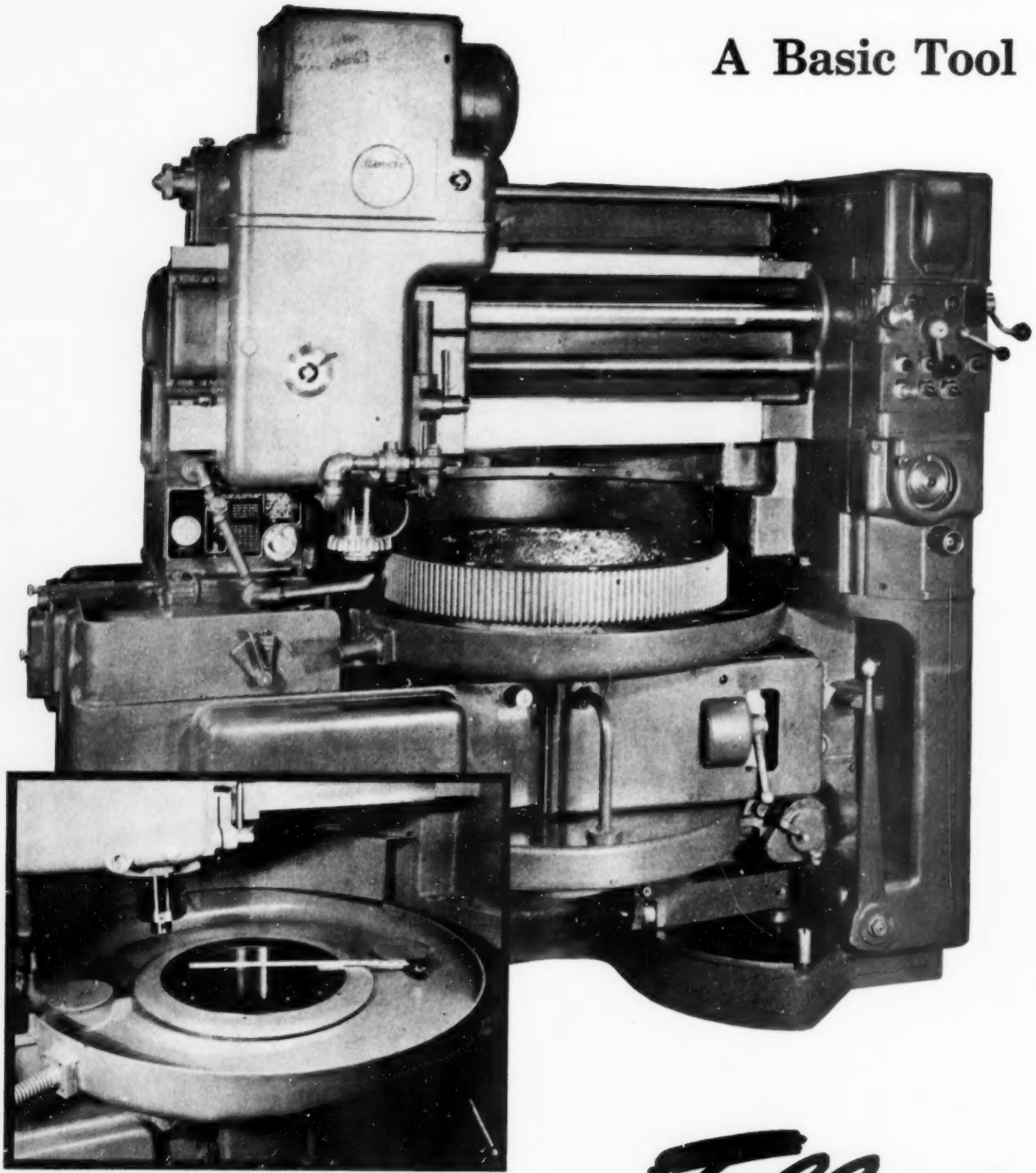


CINCINNATI 8" x 18" Tool and Die Milling Machine. Complete specifications may be obtained by writing for catalog No. M-1731.

CINCINNATI

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES • FLAME HARDENING MACHINES OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

A Basic Tool



Great flexibility in work handling is possible with the new 36Z-1 Type Gear Shaper. Note the 12" diameter straight hole in the work-spindle.

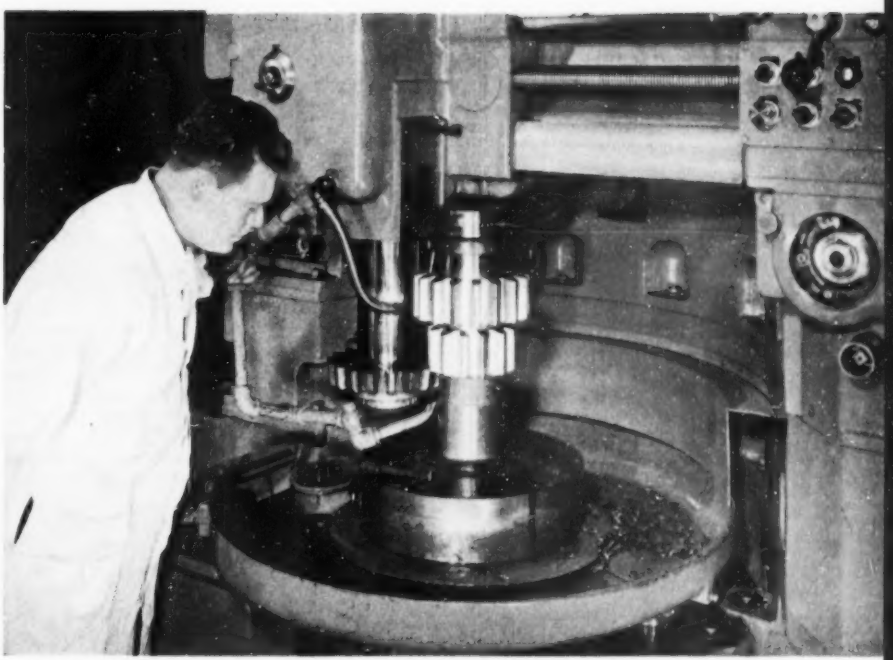
Fellows

The FELLOWS METHOD
...in action!

for

HEAVY-DUTY Gear Cutting

- *Standard 36-Type* Fellows Gear Shaper for spur or helical gears to 6" face width in all sizes up to 36" pitch diameter—external or internal. Herringbone gears, cams, ratchet teeth, splines, special contours . . . all rough and finish cut on one set-up.
- *36Z-1 Type* (with 12" hole in work spindle) for cutting large shank gears, aircraft crankshaft splines, variable pitch propeller blade hub splines, etc.



Cutting coarse pitch pinion on 36Z-1 Type Gear Shaper at the Illinois Gear & Machine Company, Chicago, Illinois.

Designed for high-production with maximum flexibility, the 36-Type Gear Shaper is the all-purpose machine for production or jobbing shop gear-cutting. Set-up time is low. Operation is easy . . . quick change-over from heavy-feed roughing to fine-feed finishing cuts by shifting a lever. Choice of 12 cutter-spindle speeds, quickly shifted through a selecting dial. Machine rigidity and power make it possible to hold close limits while taking heavy cuts. The versatile 36-Type can lower your gear production costs. Write the nearest Fellows Office for details.

GEAR SHAPER COMPANY

Head Office & Export Department: 78 River Street, Springfield, Vermont.
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VAN NORMAN 418

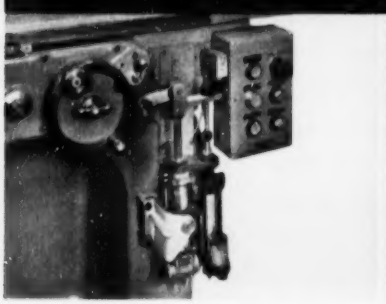
will CUT YOUR GRINDING COST of small parts

The Van Norman 418 Cylindrical grinder is "engineered" for fast, economical close-tolerance plunge or traverse grinding of small parts. It is particularly adaptable for use in toolrooms, job shops or plants where [illegible] in small or medium run. Jobs are quickly set-up . . . work-pieces are [illegible] ground and unloaded with minimum motion and effort.

Compare these outstanding VAN NORMAN features

- ★ Pope wheel spindle engineered with extra-large SKF double row cylindrical roller bearings, which have been proven on thousands of Van Norman Grinders, assure maximum accuracy and long operating life.
- ★ Heavy-duty headstock and footstock for rigidity, accuracy and smooth grinding.
- ★ Automatic starting and stopping of headstock and table traverse.
- ★ Rugged base, wide table bearing ways, separate motor drives for wheel spindle, table and headstock.
- ★ Controls are conveniently grouped in front of grinder for ease of operation.
- ★ Floor space needed, only 43½" x 79¼".
- ★ One-shot metered lubrication for all bearing surfaces.

CONVENIENTLY GROUPED CONTROLS SIMPLIFY OPERATION... INCREASE OPERATOR OUTPUT

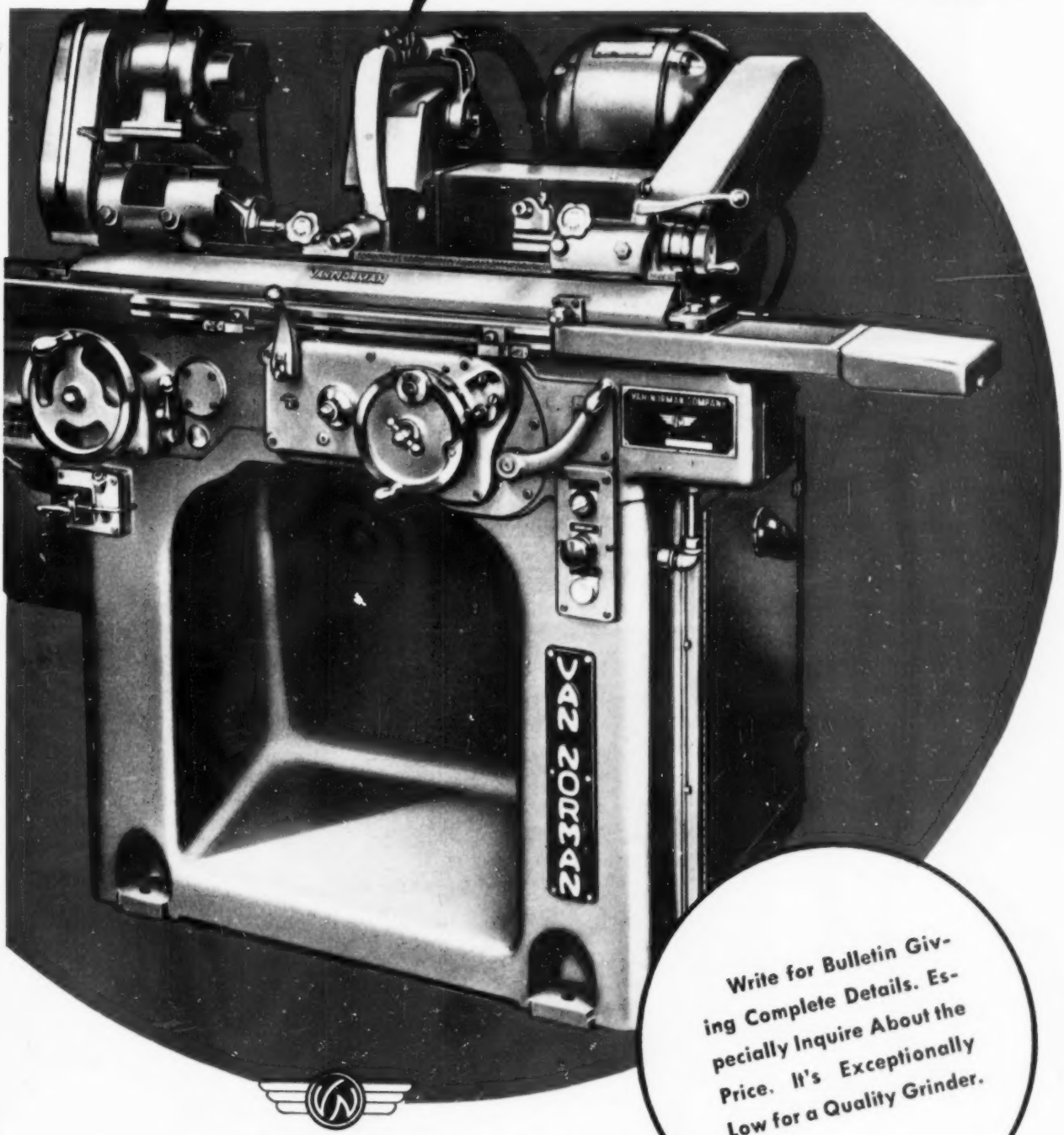


NEW HYDRA-PNEUMATIC INFEED ATTACHMENT provides completely automatic cycle for plunge grinding. It will repeat to .0002 with only correction for wheel wear necessary to hold tolerances. Timer is adjustable from 1 to 30 seconds. Fine feed adjustable to ¼" at any speed.

CONVENIENTLY GROUPED WHEEL FEED CONTROLS — Start-Stop push buttons, cross-feed handwheel, rapid infeed lever easily reached by operator. Feed handwheel arranged for power or power feed with micrometer stop to .0001" on work diameter. Rapid infeed lever starts and stops headstock, coolant and table feeds.

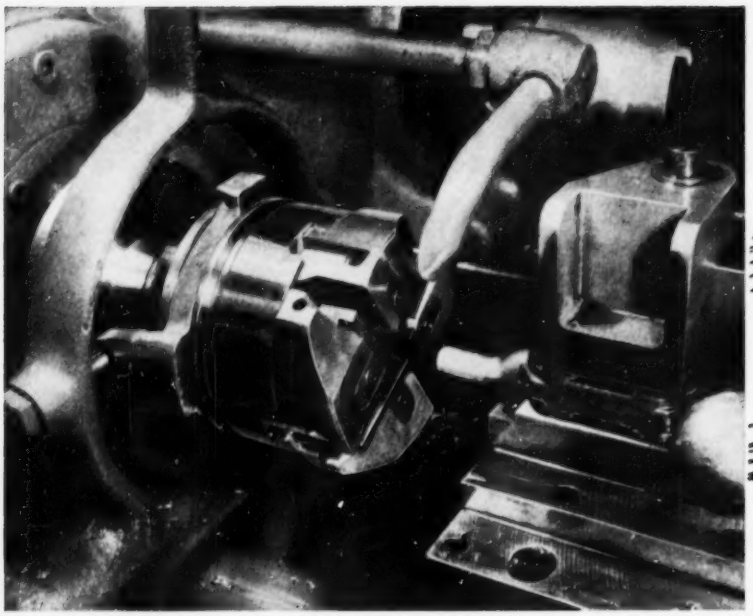
CONVENIENTLY GROUPED TABLE TRAVERSE CONTROLS — Controls at left include table traverse selector, handwheel, table start-stop lever, one shot lubrication lever — all easily reached by operator. Start-stop lever disengages handwheel when power travel is used.

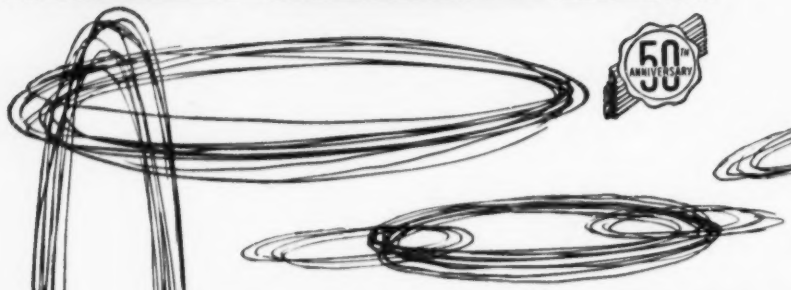
Cylindrical Grinder

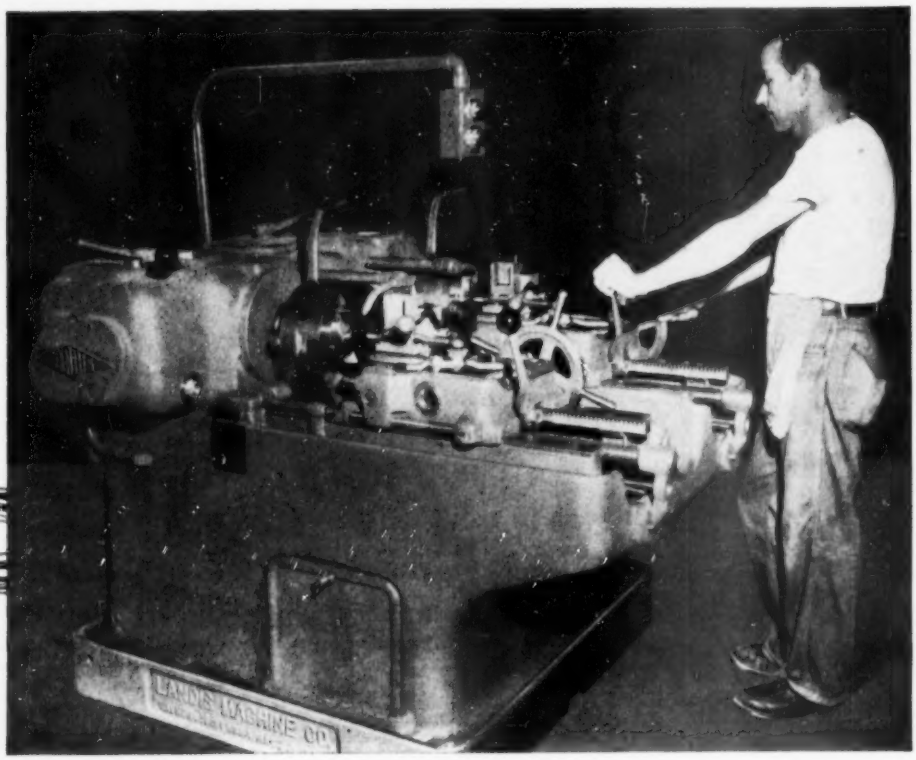


Write for Bulletin Giving Complete Details. Especially Inquire About the Price. It's Exceptionally Low for a Quality Grinder.

VAN NORMAN COMPANY
SPRINGFIELD 7, MASSACHUSETTS, U.S.A.







FASTER TURNING

Using 4 Cutting Tools

SIMULTANEOUSLY

Automotive parts production at Thompson Products in Detroit has been substantially increased by turning, facing, and chamfering on Landis Threading Machines. This LANDIS **Hollow Milling** technique makes large out-put increases possible by applying a number of simultaneously-functioning cutters, thus multiplying the feed rate of a single tool.

The illustrations show one of these parts, steering links, being turned and faced on a LANDMACO Double-Spindle Leadscrew Threading Machine. SAE 1040 steel forgings are turned (1/32" stock removal) 1⅛" in length and faced by four special turning cutters in ⅞" LANCO Hardened and Ground Heads. Production regularly averages 200 pieces per hour, with the ⅝" turned diameter held within ±.004". Four hours production is obtained between cutter grinds.

This LANDIS technique offers important advantages over other methods of turning, forming, and facing. The use of four or six simultaneously-functioning cutters, in addition to increasing production, reduces tool cost and workpiece spoilage to the minimum. The diametrically-opposing cutters evenly distribute cutting strains and maintain proper work alignment. LANDIS Cutters, available in a wide variety of styles, are economical for they are usable for most of their length with only a simple regrinding of the rake angle.

Additional information will be sent on request—please include specifications when writing.

THE WORLD'S LARGEST MANUFACTURERS OF THREAD GENERATING EQUIPMENT

LANDIS Machine CO. WAYNESBORO PENNSYLVANIA

992-C

Eliminates Extra

How Landis Multiple Wheel Grinders Reduce Precision Grinding Costs

Less Investment One IW replaces two or more conventional cylindrical types.

Less Grinding Time Any number of different concentric diameters ground in one operation with semi-automatic cycle.

Less Setup Time A single setup on the IW instead of two or more setups on the machines which the IW replaces.

Less Work Handling Only one loading and unloading operation. No moving work from one machine to another.

Landis IW Multiple Wheel Grinders are made in both 10" and 16" swing. The machine illustrated here is the 10" x 30" size.

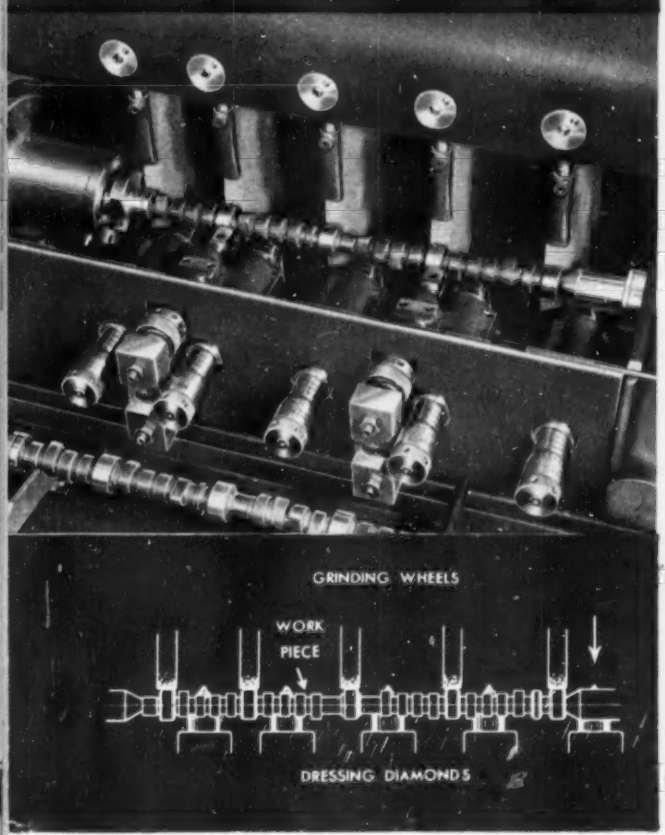
LANDIS

precision grinders

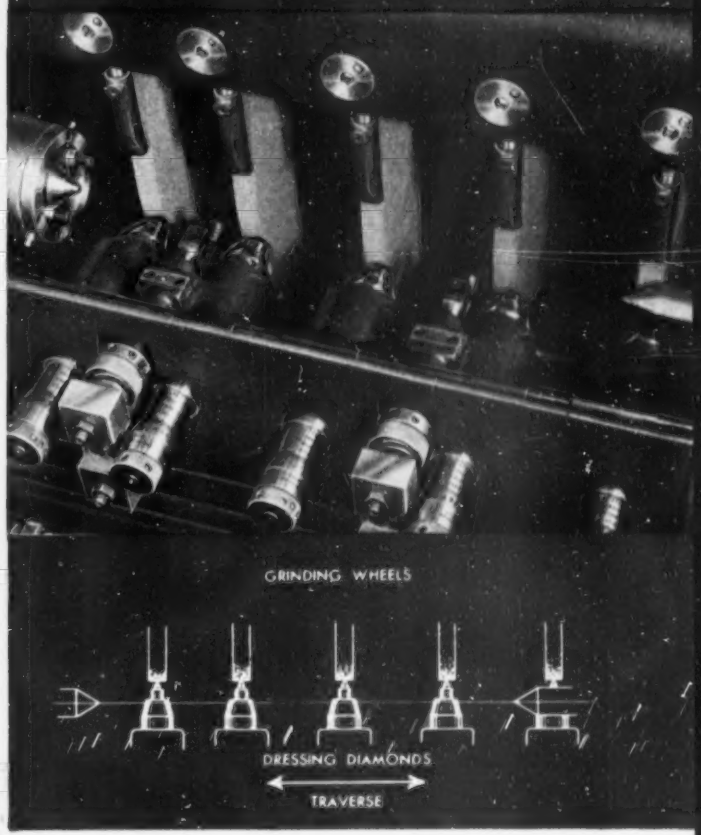
Grinding Operations

Grinds Five Diameters Concentric In One Operation

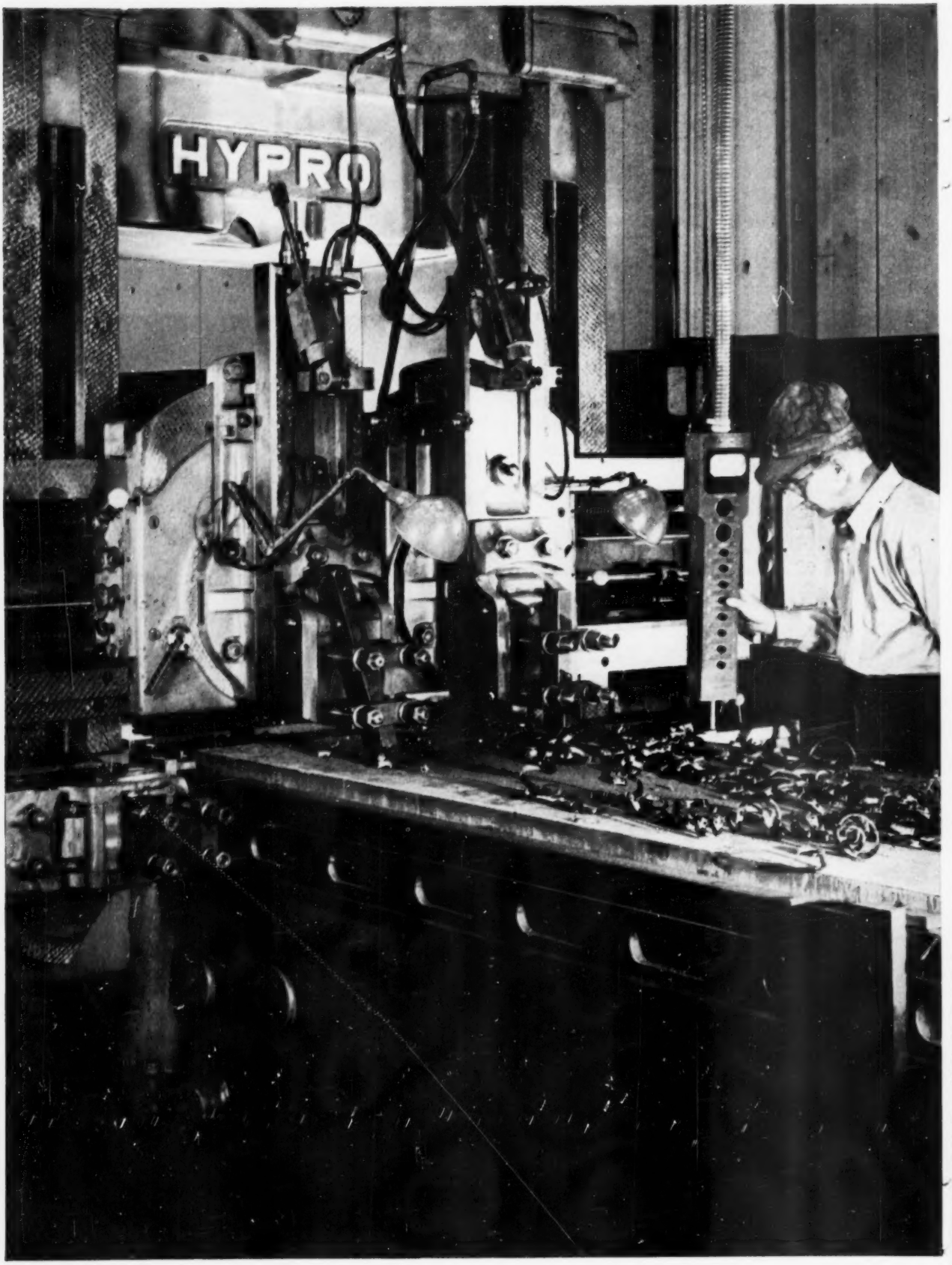
This is the finish grinding operation on the 5 line bearings of a V-8 camshaft. Stock removal is .003" to .010" and production is 60 shafts per hour. All bearings are finished in one operation.



Unique method of dressing straight wheels. Saves time and insures accuracy with individually adjustable diamond positioning. Double jet cooling on each diamond. Dresser always in position.



LANDIS TOOL COMPANY / WAYNESBORO, PENNA., U.S.A.


HYPRO

Carbide finger... with the Midas touch!

This G & L Double Housing Planer will help you make a handsome profit on every job, big or small. It has the proper power application and extra rigidity necessary to perform carbide planing operations at 300 ft. per minute

If you're searching for a heavy planer that allows you to get the fastest, most economical use of carbide cutting tools, investigate the G&L line of Double Housing and Open Side Planers.

These massive machines offer you many important advantages. In addition to the inherent rigidity of the rail, heads, housings, table and bed — a twin helical gear train table drive provides straight power flow to eliminate side thrust.

G&L HYPRO Double Housing Planers and Open Side Planers are available with working widths up to 144 inches . . . variable voltage drives up to 100 hp . . . bed lengths to suit the particular model. For complete details, see your G&L representative, or write —

GIDDINGS & LEWIS MACHINE TOOL CO.

FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty machine tools—Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; Hypro Double Housing and Open Side Planers; Planer Type Milling Machines and Vertical Boring Mills; and Davis Cutting Tools

Announcing.... a New Line of

VK GAGES

CHROME CARBIDE TAPER INSERT PLUG GAGES .500" to 1.510"

Lighter and Longer-Lived

In addition to its regular line of tungsten carbide wire type plug gages from .016" to .500" diameter, The Van Keuren Company now offers a new line of *Chrome Carbide Taper Insert Plug Gages* in the range from .500" to 1.510" diameter.

Made of Carboloy chrome carbide, grade #608*, these gages offer huge savings in cost per hole gaged. Wearing qualities of the new chrome carbide material are comparable with those of tungsten carbide. This material provides the additional advantages of being much lighter and of having a coefficient of expansion close to that of steel. The finish on VK Chrome Carbide Gages will average .5 RMS or better.

Van Keuren Chrome Carbide Taper Insert Plug Gages are available in Class Y, X, XX accuracies at moderate prices and on a reasonable delivery basis.

Send for a copy of the 220-page Van Keuren Catalog and Handbook No. 35 containing valuable technical and engineering information on measuring problems and methods. Address: The Van Keuren Co., 173 Waltham St., Watertown, Mass.

*Trademark of Carboloy Dept. of General Electric Co.

VK

34th YEAR

THE Van Keuren CO.,

173 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires • Chrome Carbide Taper Insert Plug Gages

"Easy to order!"

"Easy to install!"

FLEXMOUNT Oscillating Conveyor...

now available from stock...

cuts costs of collecting chips

YES, you can now buy FLEXMOUNT Oscillating Conveyors right "off the shelf." Stock sections in 8, 12 and 18-in. trough widths make up into any desired length. There's no waiting for special engineering.

The compact flexibility of Link-Belt's FLEXMOUNT makes it the low-cost answer for conveying chips, turnings, blasting shot, punchings or stampings. Spillage and leakage are eliminated by the high-side, one-piece trough. And dividers can be installed to handle two or more materials, such as brass and steel chips, simultaneously without mixing.

See the versatile FLEXMOUNT at your nearby Link-Belt factory branch store or distributor today. For complete installation and operating data, ask for Book 2478.

13.197-A

LINK-BELT

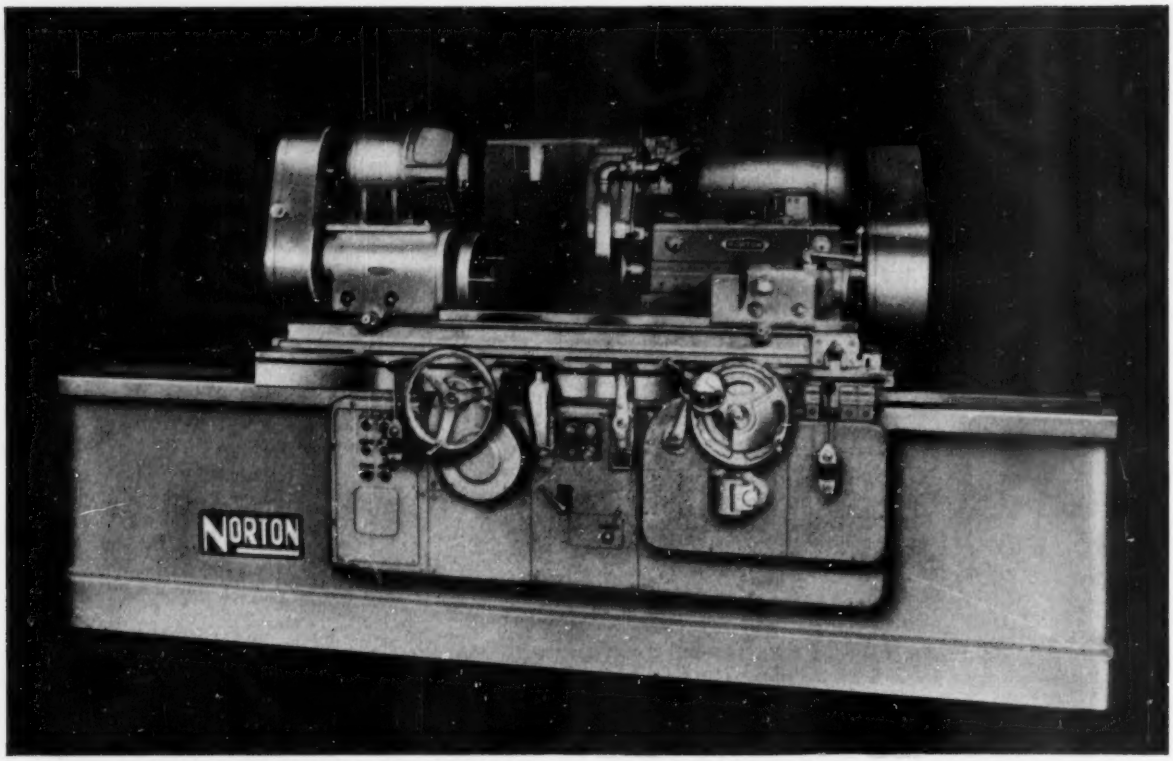
FLEXMOUNT OSCILLATING CONVEYORS

LINK-BELT COMPANY: Plants: Chicago, Indianapolis, Philadelphia, Colmar, Pa., Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle; Scarboro, Toronto and Elmira, Ont. (Canada); Springs (South Africa); Sydney (Australia). Sales Offices, Factory Branch Stores and Distributors in Principal Cities.

FLEXMOUNT Oscillating Conveyors are used for both the collecting and the main conveyors at this Ohio plant. Aluminum chips are handled at low cost.

How Positive Action moves material

Positive-action, constant-stroke eccentric drive provides a powerful, yet gentle upward and forward oscillating motion. Large volumes of material are moved in a uniform, continuous flow, regardless of surges. Resonant spring action of resilient legs cuts power requirements to a minimum.



NORTON 10" TYPE CTU SEMIAUTOMATIC GRINDER is first choice in production lines and in job shops. No other cylindrical grinder offers you such a unique combination of speed, accuracy, flexibility and sturdiness. No wonder users have reported that Norton 10" CTU's have doubled production . . . replaced 2 or 3 machines . . . eliminated extra operations . . . made operators more productive . . . and have given them the "Touch of Gold". *Catalog No. 1787* has complete data on sizes, advantages, features and optional equipment that help you put extra profits into your production. It will pay you to look into the high-speed, high-finish grinding this machine makes possible.

These cylindrical grinding machines give you "TOUCH OF GOLD" value . . . in your profit margins

The Norton CTU is such a money-maker it brings you the touch of gold. It adds value to each piece of work it handles — and it actually cuts the cost of grinding . . . thus adding to your product profits.

It's easy to see why. Your operator loads the work . . . *touches one lever* . . . and stands by while the machine does the rest . . . as easy as 1-2-3.

Work is automatically ground to size under electric timer control . . . and the wheel head resets itself for the next cycle.

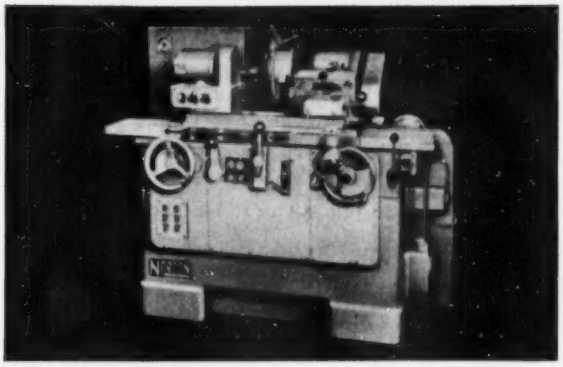
All three basic Norton CTU Semiautomatic Grinders: 4", 6", and 10" offer you the same advantages over their different ranges of work sizes. You can also get the 6" grinder with a 10" swing and the 10" grinder with a 14" swing by specifying Type LCTU. The Norton line of Type CTU Cylindrical Grinders also includes plain machines for traverse grinding. Your Norton Representative will be glad to help you choose the one that best fits your requirements.

Norton Cylindrical Grinding Machines are just one phase of *the world's most complete line of grinders and lappers* . . . products of Norton's engineering leadership in the development of both grinding wheels and machines.

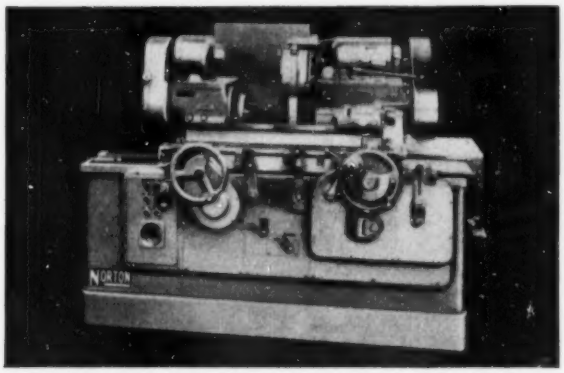
Remember — only Norton offers you such long experience in both grinding wheels and machines to help you produce more at lower cost . . . to have that "Touch of Gold."

Norton welcomes opportunities to work with you on the planning level to fit standard or special grinding machines into your immediate plans or for "post emergency" production.

For complete information, see your Norton Representative or write us direct for the catalogs listed under the machine illustrations. NORTON COMPANY, Machine Division, Worcester 6, Mass.



NEW NORTON 4" TYPE CTU Semiautomatic Grinder in 12" and 18" work length capacities now makes it practical for you to apply high-finish grinding for adding value to small parts. *Catalog No. 531* gives you full details.



NORTON 6" TYPE CTU Semiautomatic Grinder, in 18" and 30" work length capacities, has a performance record that's worth investigating. *Catalog 1488* tells the whole interesting story.

for your product

To Economize Modernize With NEW

NORTON

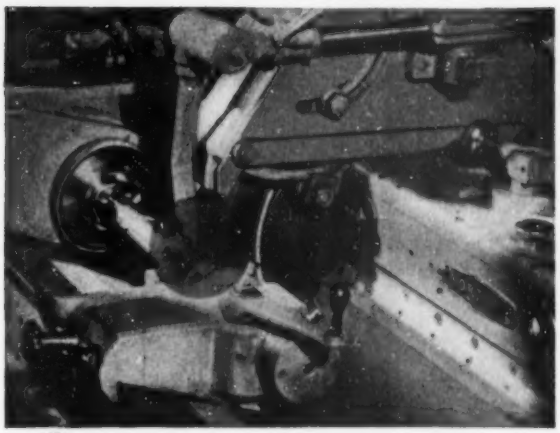
GRINDERS and LAPPERS

Making better products to make other products better

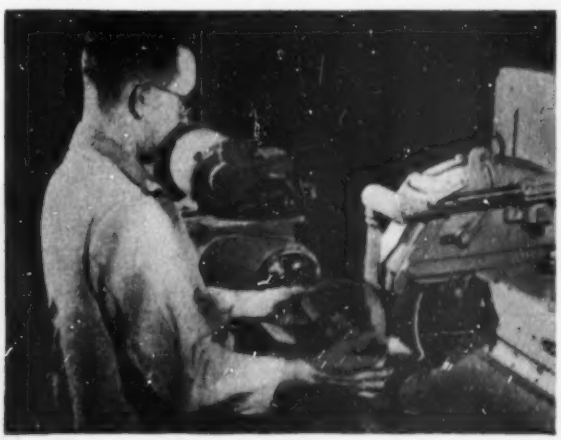
District Sales Offices: Hartford • New York • Cleveland • Chicago • Detroit
In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5, Ontario

EASY AS 1-2-3

1. Operator loads machine and touches starting lever.

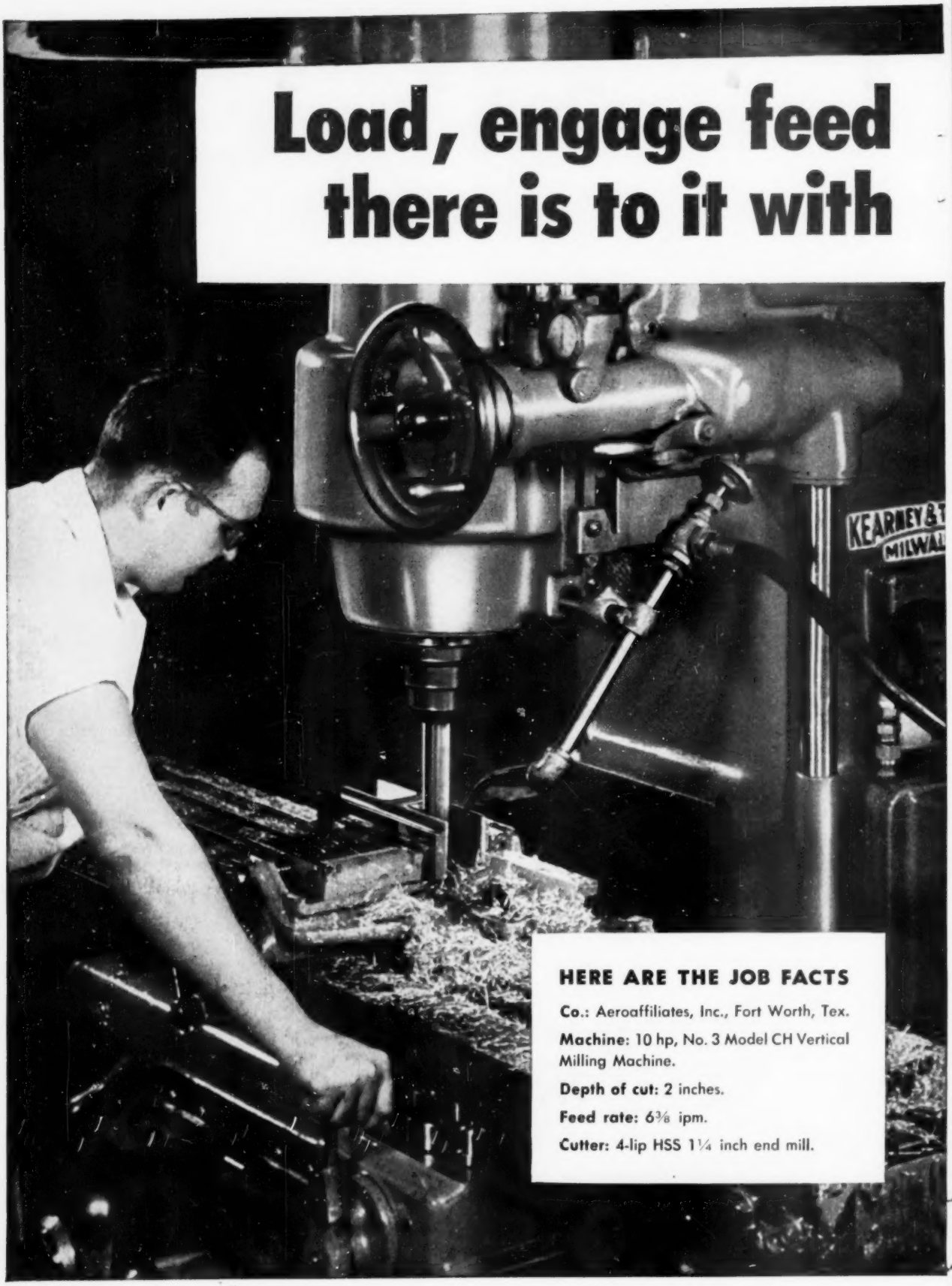


2. Machine automatically grinds part to required size and finish — while operator attends another machine.



3. Operator unloads machine.

Load, engage feed there is to it with



HERE ARE THE JOB FACTS

Co.: Aeroaffiliates, Inc., Fort Worth, Tex.

Machine: 10 hp, No. 3 Model CH Vertical Milling Machine.

Depth of cut: 2 inches.

Feed rate: 6⅜ ipm.

Cutter: 4-lip HSS 1¼ inch end mill.

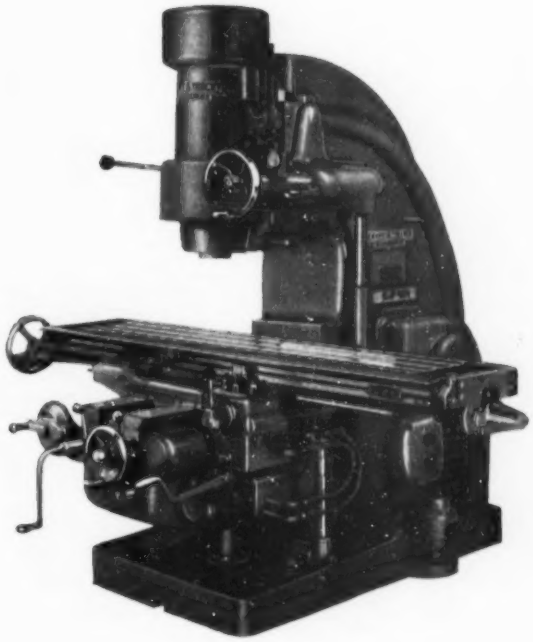
and unload—that's all this CH miller!

Aeroaffiliates of Texas select Kearney & Trecker's 10 hp No. 3 Model CH Vertical Milling Machine with *Mono-Lever and Automatic Cycle Table Control*, to speed up milling of aircraft parts and reduce operator fatigue!

TO finish-mill aluminum vertical beam fittings, this manufacturer put production on an almost automatic basis without sacrificing accuracy. He's handling the job on a 10 hp, No. 3 CH Vertical Milling Machine equipped with Mono-Lever and Automatic Cycle Table Control.

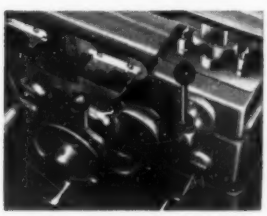
Now, after the original setup, all the operator does is load the machine, engage the feed and unload. Production is up, accuracy is maintained and operating conditions have been greatly improved to the reduction in operator fatigue.

Check this great CH line of machines for yourself. See how you, too, can cut costs, increase productivity, improve safety, get better finished products. Contact our representative or write Kearney & Trecker Corp., 6784 W. National Avenue, Milwaukee 14, Wisconsin.

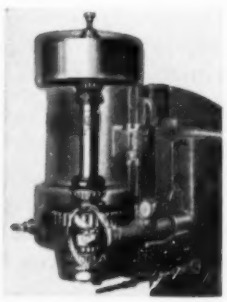


10 hp, No. 3 Model CH Vertical Milling Machine

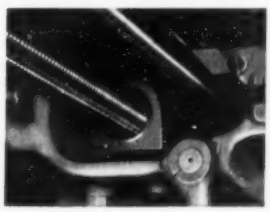
CH Milling Machine features that helped increase output — cut cost per piece



Greater Operating Convenience through Mono-Lever control facility (optional at extra cost) for table feed and rapid traverse. Also, rapid-set micrometer dials — with new vapor blasted, satin finish for greater legibility to avoid setting errors.



Greater Cutting Efficiency through spindle-mounted flywheel, (optional on CH Models) running with three bearing support. On this job it meant fast metal removal and an excellent finish.



Smoother Feed Performance through large dia. heavy-duty table feed screw that affords greater bearing contact, runs through extra-long table feed nut. All models are equipped with backlash eliminator for more effective climb milling, greater accuracy and longer screw life.

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

What is it costing you NOT to replace your TURRET LATHES?

IT MAY be costing your company a great deal of money not to replace its old machine tools.

Here's what we mean—in dollars and cents. One company we know replaced two old turret lathes with one new Warner & Swasey No. 4 Universal. Output more than doubled and the company saved over $3,400 a year. Another company invested in a new 4-A Heavy Duty Warner & Swasey and reduced unit cost from $2.60 to $1.26 per piece.

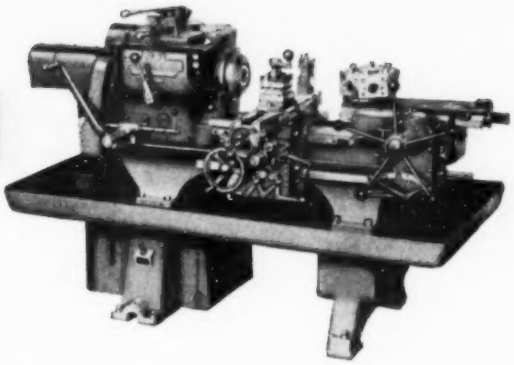
These are but two examples. Our files are full of others.

The point, of course, is this: These savings might well be yours—savings through increased production which cuts costs—which in turn enables you to get and handle additional business.

You may never know just how much it really *is* costing you not to replace, until you call in your turning specialist—your Warner & Swasey representative. He'll be glad to make a detailed analysis of your operation—show you how, by replacing old machine tools, you can increase your profits . . . substantially!

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER &

RAM TYPE



NO. 2 ALL-GEARED HEAD
1" Bar Capacity—14" Swing

NO. 3 UNIVERSAL
1½" Bar Capacity—15⅜" Swing

NO. 4 UNIVERSAL
2" Bar Capacity—18⅛" Swing

NO. 5 UNIVERSAL
2½" Bar Capacity—20" Swing

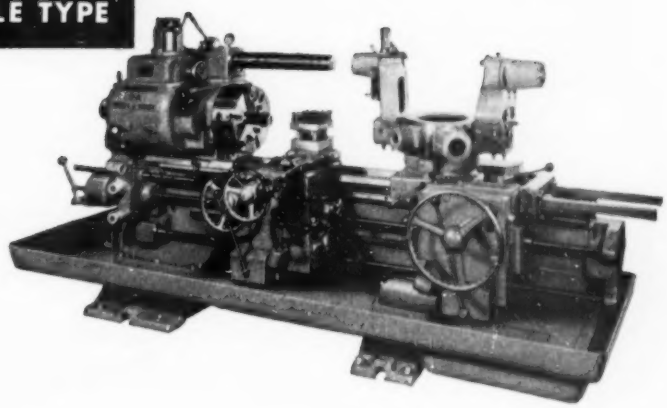
SADDLE TYPE

1-A UNIVERSAL HEAVY DUTY
2½" or 3" Bar Capacity—16¼" Swing

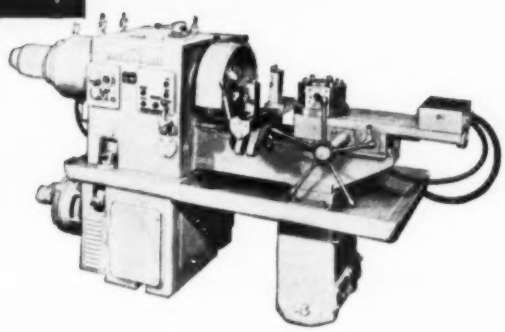
2-A UNIVERSAL HEAVY DUTY
3½" Bar Capacity—20" Swing

3-A UNIVERSAL HEAVY DUTY
4½" or 6" Bar Capacity—23½" Swing

4-A UNIVERSAL HEAVY DUTY
8", 9" or 12" Bar Capacity—28¼" Swing



ELECTRO-CYCLES



NO. 1 ELECTRO-CYCLE
⅝" Bar Capacity—11" Swing

NO. 2 ELECTRO-CYCLE
1" Bar Capacity—14" Swing

NO. 3 ELECTRO-CYCLE
1½" Bar Capacity—15⅜" Swing

16" ELECTRO-CYCLE
1½" Bar Capacity—16⅞" Swing

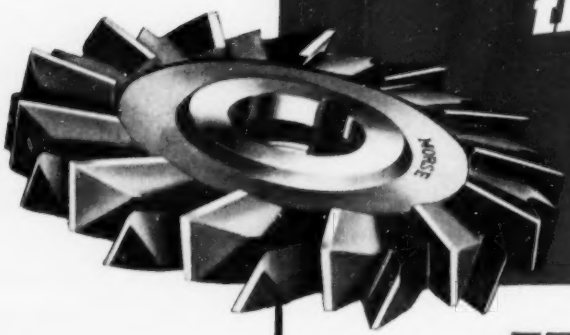
● There is a proper size Warner & Swasey Turret Lathe to fill your turning needs, for it has always been a cornerstone of Warner & Swasey design to build an individual model for each range of work.

Whatever Warner & Swasey best fits *your* specific requirements, you'll get accuracy to meet your own exacting standards . . . fast production with minimum scrap loss . . . adaptability to scores of turning jobs.

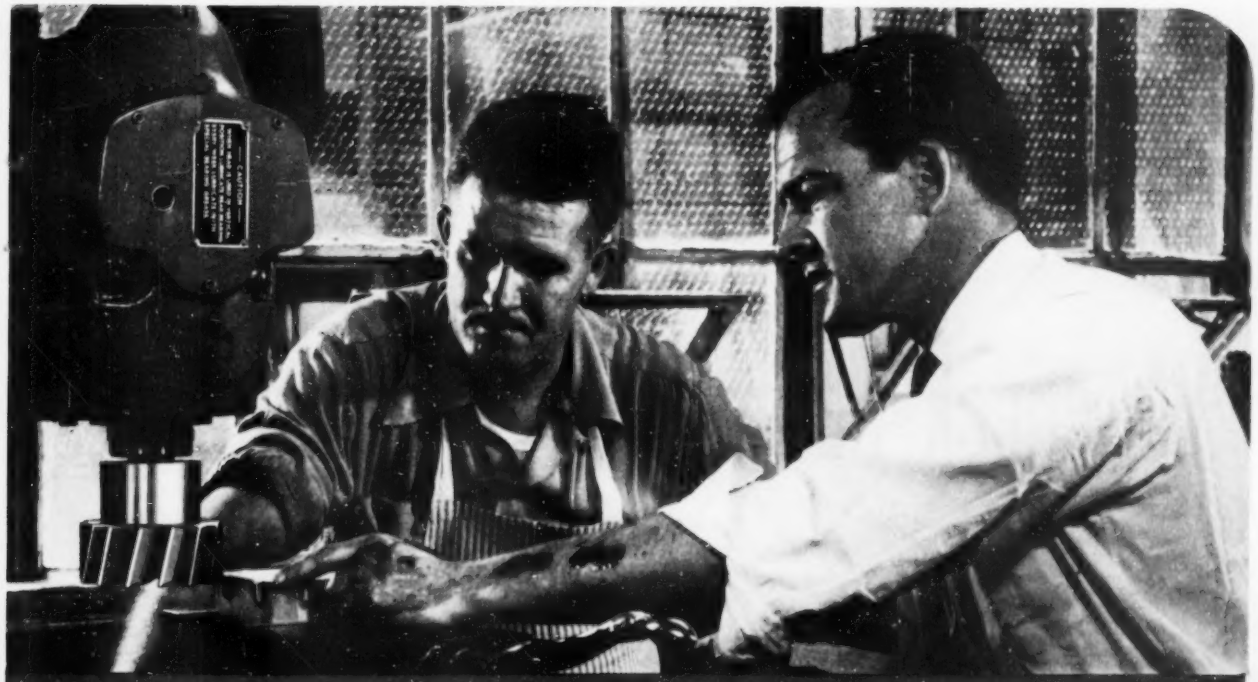
WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

SWASEY MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY

He never cares how black his white collar gets—when there's a job to be done for you!



...Your Morse-



Franchised Distributor

He's an everyday working man, your Morse-Franchised Distributor. He pitches in with your own men, right up to the elbows, when there's a cutting tool problem to be licked. Remember he has the hard-earned experience to do it . . . backed by the tool industry's finest engineering staff and the confidence that comes of his knowledge that back of him is a *complete line of the world's finest cutting tools.*

So when you are faced with a tough problem involving cutting tools, send for your Morse-Franchised Distributor. He'll take it off your hands, and clean it up fast and right! *Call him today.*

MORSE TWIST DRILL & MACHINE COMPANY, NEW BEDFORD, MASSACHUSETTS

(Division of VAN NORMAN CO.) • Warehouses in New York, Chicago, Detroit, Houston, San Francisco

MORSE

Cutting Tools

Buy them by phone from your Morse-Franchised Distributor and save ordering time

Here's another reason it pays to get a proposal from Fosdick

We check flatness to 40 millionths

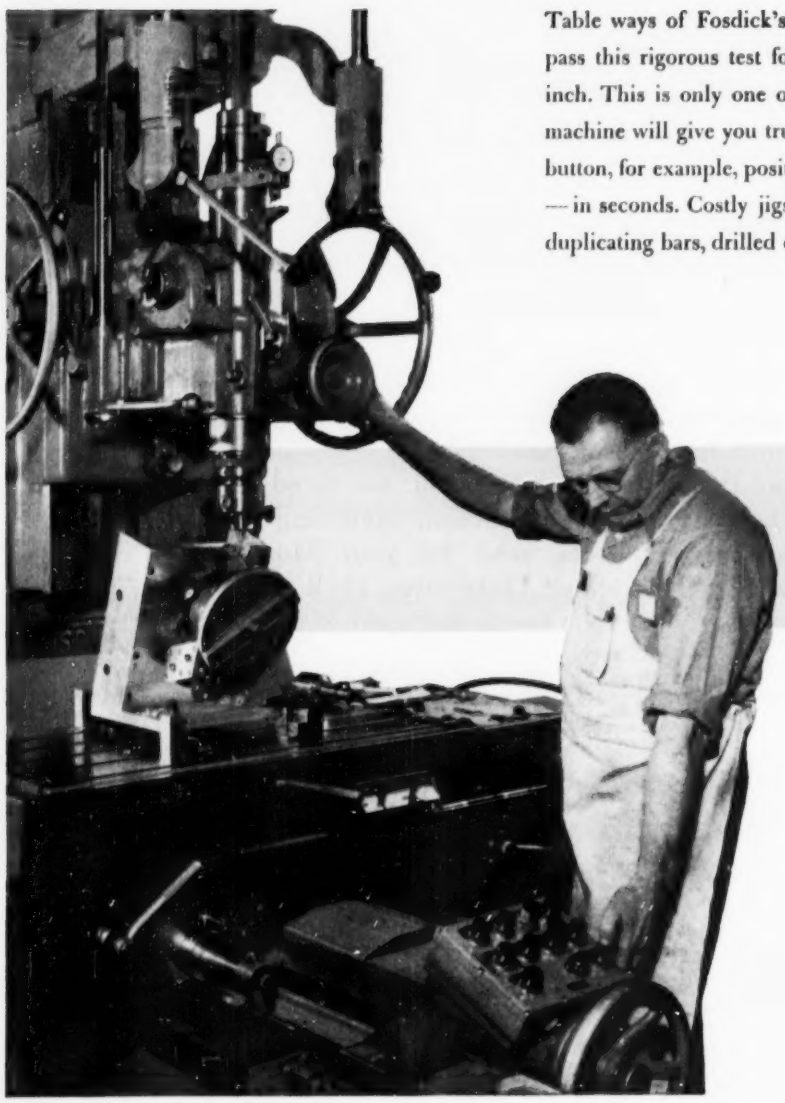


Table ways of Fosdick's Automatic Positioning Machine must pass this rigorous test for flatness—within 40 millionths of an inch. This is only one of many tests we run to make sure this machine will give you true precision production. The touch of a button, for example, positions work for each new hole to ± .0001″ —in seconds. Costly jigs have been replaced by two $\frac{5}{8}$″ square duplicating bars, drilled quickly for the job, stored easily.

to give you

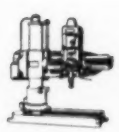
Boring Time "Nose Dives" at Fairchild.

Mass production of precision magnesium housings for commercial and military cabin pressurizers at Fairchild Engine and Airplane Corp. demanded speed and high accuracy. Fosdick's proposal recommended Automatic Positioning Machines. Now Fairchild drills, faces and bores $\frac{31}{32}$″ holes with accuracy to ± .0001″— *has slashed boring time 40% over former methods.*

For full description of the Automatic Positioning Machine ask for Bulletin APA.

precision production like this

Need Drilling Equipment? Get a Proposal from Fosdick!


Radial Drills

Jig Borers

Sensitive and Upright Drills

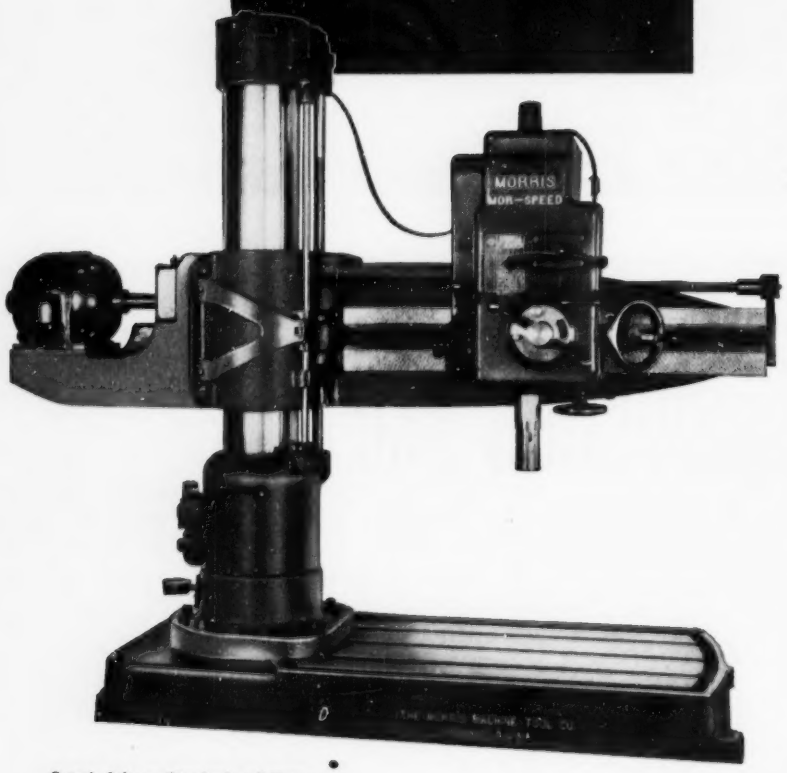
Sensitive Radial Drills

Automatic Positioning Machines

FOSDICK

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

get speed...
safety...
accuracy...
with
MORRIS
MOR-SPEED
RADIAL DRILLS



completely centralized controls . . .

On a MORRIS Mor-Speed Radial Drill every control is in sight . . . within reach . . . easy to operate fumble free!

The operator makes speed, feed and other adjustments, quickly and easily—concentrates on job, rather than on bending, stepping, stooping or reaching for awkward controls. A wide selection of automatic stops and trips cut time per operation to a minimum. Carefully designed, tested safety devices assure complete protection to machine, operator and work. Alloy steels, modern hardening methods and anti-friction bearings . . . at every wear-vulnerable point . . . plus constant lubrication for all operating parts, protect and maintain precision and make Mor-Speed Radials capable of higher production over longer periods of time.

Find out how MORRIS Mor-Speed Radial Drills can make precision work possible and profitable for you, even under your heaviest scheduling demands.

WRITE FOR BULLETIN NO. 59
Early delivery dates available.

THE MORRIS MACHINE TOOL COMPANY
933 HARRIET ST., CINCINNATI 3, OHIO

- 9-inch Column Standard and Heavy Duty models with 3 and 4-foot arms.
- 11-inch Column Heavy Duty models with 3, 4, 5, and 6-foot arms.

a better product at less cost —with precision PLUS production

Morris

Gardner Grinding increases production from 50 to 180 pieces per hour!

Replaces 2 milling operations on universal joint yokes

GARDNER Grinders

Grinds TWO parallel sides in ONE operation—and improves accuracy, too

121M

WORK DATA

MACHINE	No. 125-26" Gardner Double Spindle Grinder
PART	Universal Joint Yokes for automobiles and trucks
OPERATION	Grinding two parallel sides of yoke simultaneously
STOCK REMOVAL	.030" maximum overall
TOLERANCES	.0015" to .002" for squareness with hole; .001" to .0015" for uniformity; .003" or better for concentricity with splined hole
PRODUCTION	180 pieces per hour
TOOLING	Power operated sliding work table with work holding fixture

Send for new catalog

GARDNER MACHINE COMPANY

410 East Gardner Street · Beloit, Wisconsin, U. S. A.

Outstanding Time Saver...

The New Cincinnati Electro-Magnetic Clutch and Brake alone brought a 30% time-saving here

The New Cincinnati Magnetic Clutch and Brake, with its single, convenient control lever, gives the operator the fastest, simplest and most accurate control of his Shaper and converts waste time into productive time.

This powerful clutch and brake requires no adjustment, and has a long, maintenance-free life.

Write for Cincinnati Shaper Catalog N-5.

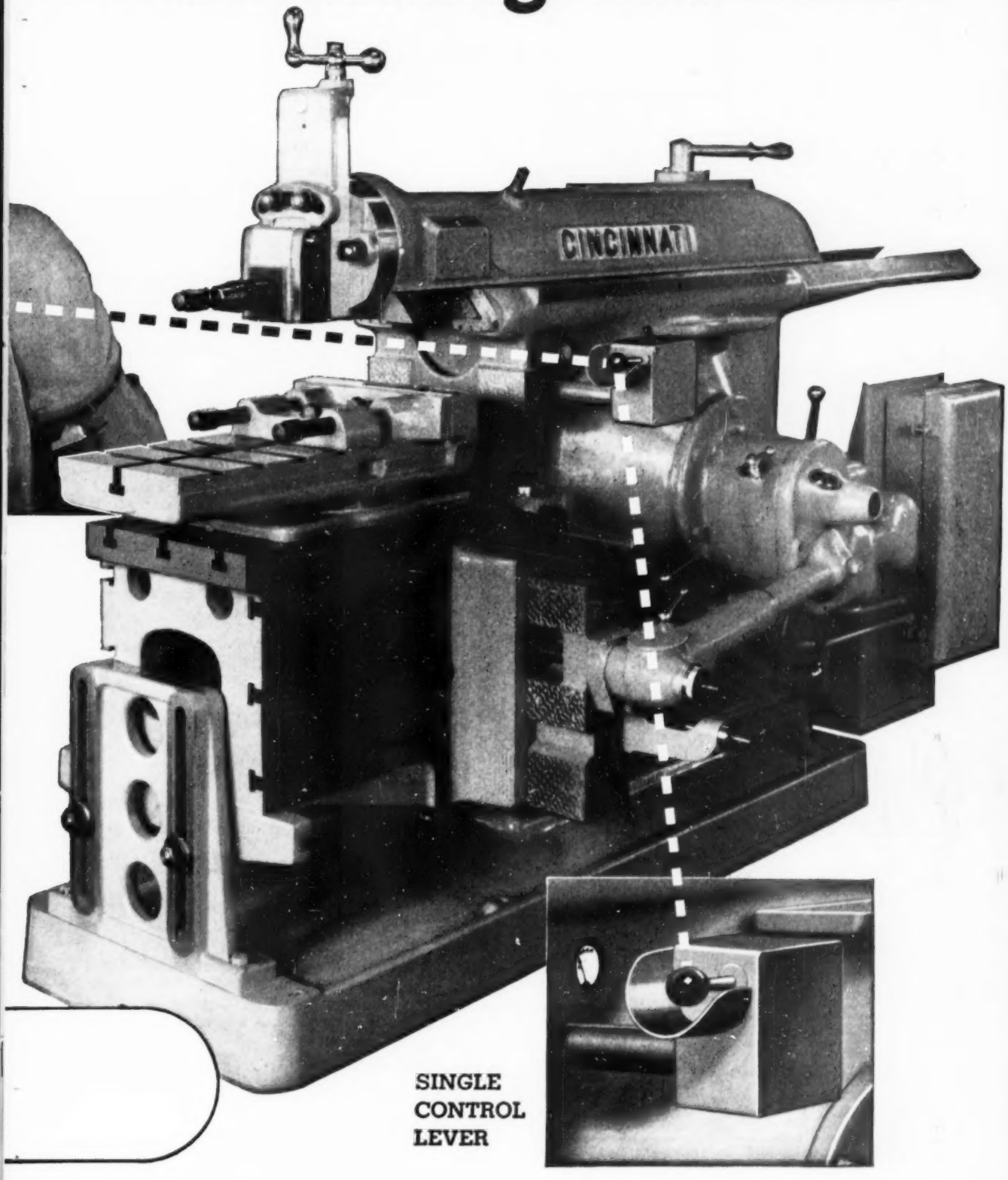
Shaping time on 7 internal oil grooves in these steel sleeves was reduced from 12.5 minutes to 8 minutes, by the Cincinnati Electro-Magnetic Clutch and Brake.

CINCINNATI

THE CINCINNATI SHAPER CO.

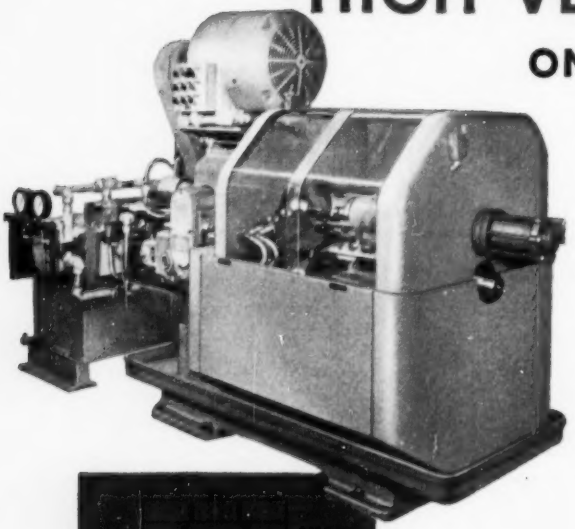
CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

....Outstanding ACCURACY



SINGLE
CONTROL
LEVER

AUTOMATICITY BACKS UP HIGH VELOCITY TURNING ON FAY AUTOMATICS



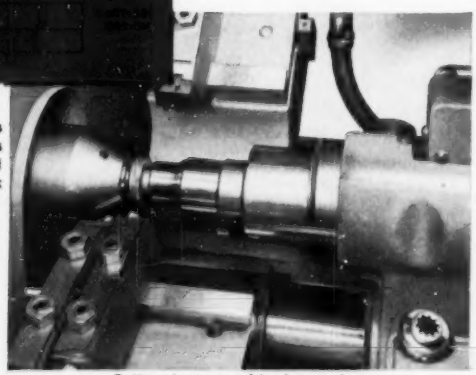
SIDE GEARS
18 Seconds Floor to Floor — 635 SFM

Two 8" Fays, with Automatic Sequential Control, machine all exterior surfaces of the blanks in two operations; one machine for each. The major diameter is 2-15/16" and floor to floor time is approximately 18 seconds in each operation.

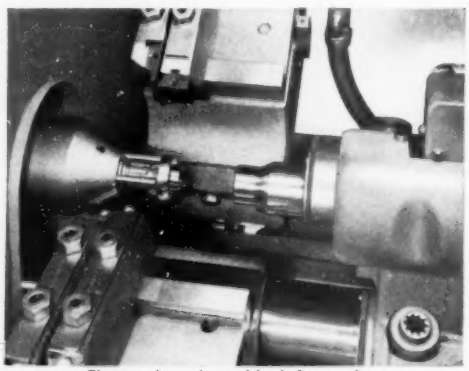
Automatic Cycle—The machines are equipped with automatically operated splash guards and automatically air-operated tailstock rams for pressing the blank onto a splined arbor equipped with automatically operated ejector pins.

The operator places the blank on the end of the arbor, and pushes the cycle start button. *Automatically, the guard closes, the tailstock ram presses the piece onto the arbor and then retracts. The carriage turns, the back arm faces, and at the end of the cuts, ejector pins push the piece onto the loading section of the arbor* from which it is removed manually.

FIRST OPERATION: Note intricate movements of the carriage, which turns the hub, back angle and major diameter. The back arm faces and forms.



Tailstock presses blank on arbor



Ejector pins release blank from arbor

Production management regularly relies upon the engineering services of Jones & Lamson for the latest information on methods, costs, tooling and performance. Why not consult us about YOUR *turning, threading and inspection problems.*

JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., 502 Clinton St., Dept. 710, Springfield, Vt., U.S.A.

FAY LATHE DIVISION

Ask your Distributor

Photograph by Paul Davis

The extra quality built into every Butterfield tap
pays off on your production line.

BUTTERFIELD

Union Twist Drill Company ***Butterfield Division*** *Derby Line, Vermont, U. S. A.*

TAPS • DIES • REAMERS • DRILLS • COUNTERBORES • SCREW PLATES

Photograph by Paul Davis

TAPS *by* CARD

Built into every Card tap are years of concentration on one ideal — to build the best taps money can buy.

Completely stocked offices at Chicago, Detroit, Fort Worth, Los Angeles, New York, San Francisco and Seattle.

See your local Card distributor for prompt deliveries and helpful service

S. W. CARD MANUFACTURING CO., MANSFIELD, MASS. • DIVISION OF UNION TWIST DRILL CO. **TAPS • DIES • SCREW PLATES**

UNION

Unretouched Photograph
by Morton Berger

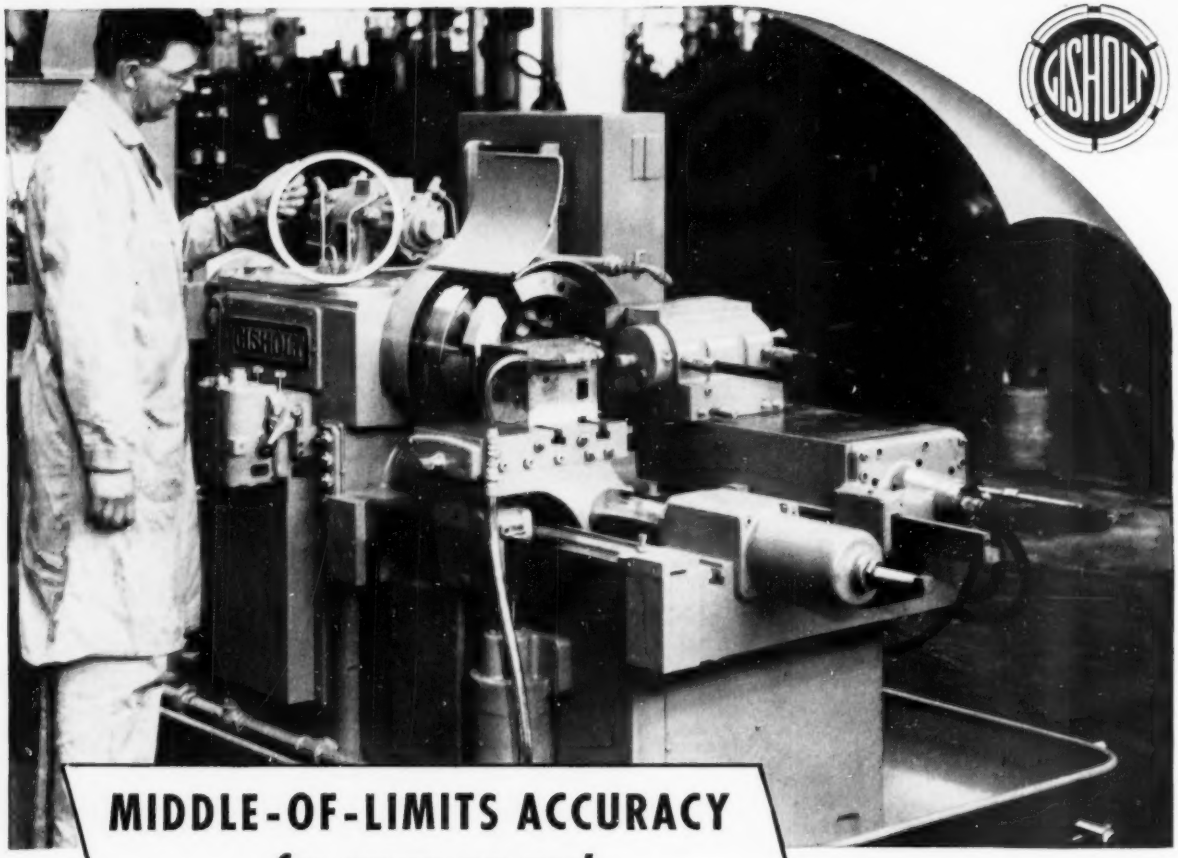
Perfectly designed for its job . . . .

Union's long experience in the cutting tool field reflects itself in the excellent performance of every tool it makes.

UNION TWIST DRILL COMPANY • ATHOL, MASSACHUSETTS

Milling Cutters **Gear Cutters** **Twist Drills** **Hobs** **Reamers** **Carbide Tools**

OWNERS AND OPERATORS OF: **S. W. CARD MANUFACTURING CO. DIVISION, Mansfield, Mass.** TAPS, DIES, SCREW PLATES
BUTTERFIELD DIVISION, Derby Line, Vermont DRILLS, TAPS, DIES, REAMERS, COUNTERBORES, SCREW PLATES
BUTTERFIELD DIVISION, Rock Island, Quebec MILLING CUTTERS, TWIST DRILLS, HOBS, REAMERS, TAPS, DIES, SCREW PLATES



MIDDLE-OF-LIMITS ACCURACY

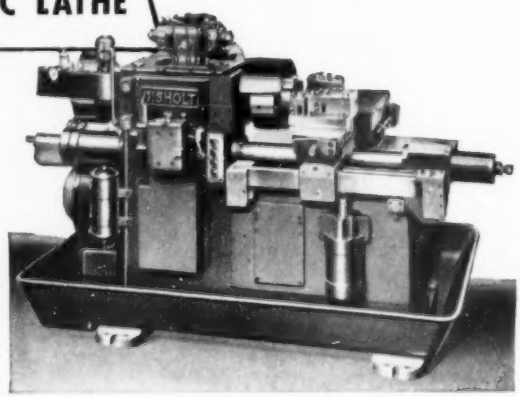
for years on end

NO. 12 HYDRAULIC AUTOMATIC LATHE

Loss of accuracy due to wearing parts? You won't get it with this modern automatic lathe—even after years of hard service. There are no complicated mechanisms to wear—it's that simple!

All parts having to do with tool movement are completely surrounded by oil and lubricated under pressure. Both carriages move on hardened and ground steel surfaces. For all practical purposes, there is no wear-out. Since both front and rear tool slides feed against and dwell at positive dead stops, utmost accuracy is assured in finished dimensions.

Yes, you can count upon middle-of-limits accuracy for many years to come. What's more: you can count upon trouble-free operation that cuts maintenance bills to almost nothing. Write for literature.



THE GISHOLT NO. 12 HYDRAULIC AUTOMATIC LATHE **is a heavy, rugged machine, yet well suited for light, fast jobs.**

GISHOLT

MACHINE COMPANY

Madison 10, Wisconsin

THE GISHOLT ROUND TABLE

represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

For HYDRAULIC presses, too . . . it pays to specify BLISS

New BLISS HYDRO-DYNAMIC PRESS

helps Ford form 1000 different wing parts

Four die slides and a choice of any pressure up to 5000 tons give short run versatility

High pressures and short runs are typical requirements of modern aircraft production. To meet these needs during World War II, Bliss developed special rubber pad forming presses. Now pressure requirements are higher still. The Ford Motor Company's new Hydro-Dynamic press has *5000 tons capacity*. And it produces over 1000 different wing parts at Ford's Kansas City plant.

Here's how it works: While one die slide is in the press, blanks are set up or dies changed on the other three. Slides can then be fed to the press in any sequence; operators at each of the die slide tables can select any pressure required up to 5000 tons; and, of course, the rubber pad forming techniques keep tooling costs down.

Like this Ford installation, many Hydro-Dynamic presses are engineered for special-purpose use. But also available are standard Hydro-Dynamic presses designed to meet the more common production problems. Both types are described in Catalog 30-A which is yours for the asking.

Simply write or wire address below.

RUBBER PAD FORMING *of small aircraft parts, in comparatively short runs, has reduced tooling expenses, cut preproduction time and is generally less costly than conventional drop hammer methods. Bliss press engineers helped pioneer the development during World War II.*

BLISS on your press is more than a name . . . it's a *guarantee*

E. W. BLISS COMPANY, Canton, Ohio

PRESSES, ROLLING MILLS, SPECIAL MACHINERY

E. W. Bliss (England) Ltd., Derby, England • E. W. Bliss Company (Paris), St. Ouen sur Seine, France

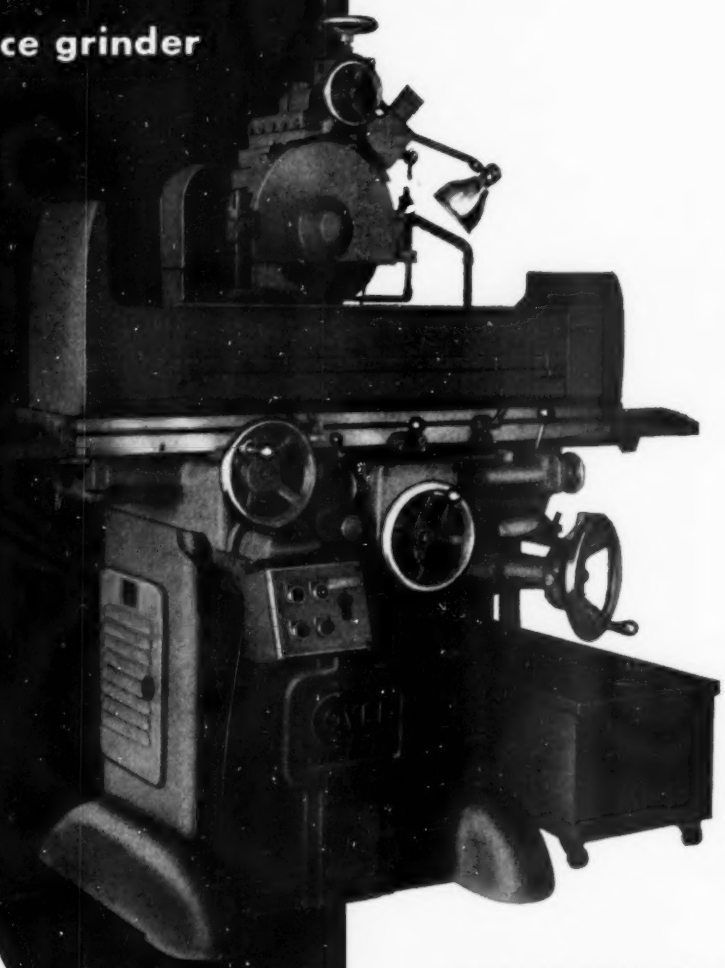
U. S. Plants in Canton, Salem and Toledo, Ohio; and Hastings, Michigan. *Branch Offices* in Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, Toledo; and Toronto, Canada. *West Coast Representatives:* Moore Machinery Co., Los Angeles and San Francisco; Star Machinery Company, Seattle. *Other representatives throughout the world.*

WHAT COVEL'S *80* YEARS CAN MEAN TO *you*

when you select a surface grinder

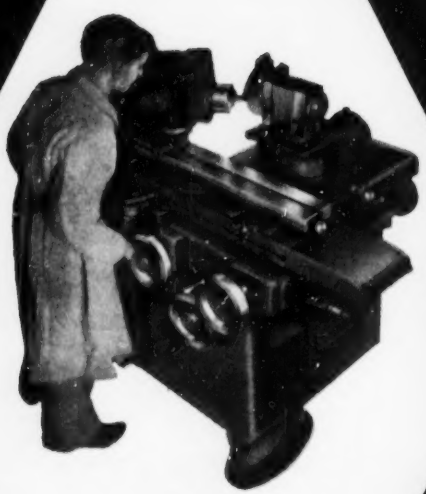
It takes more than special features and fine materials to build the best surface grinders. Skilled workmanship, yes . . . modern methods and equipment, certainly. But there's a rare quality—a plus value that can make your grinder investment extra sound and that quality is yours with Covel . . . It's simply this: EIGHTY YEARS OF CUMULATIVE EXPERIENCE—of constant progress, keeping pace through four war production periods and through many business peaks and valleys.

So, when you select a Surface Grinder —or a Cutter and Tool Grinder, call on Covel and draw on this wealth of practical, productive experience. Send for data.



SURFACE GRINDERS
HYDRAULIC FEED:
14"x24"; 8"x24"; 6"x18"
HAND FEED: 6" x 18"

Send for Bulletin A2-103



UNIVERSAL CUTTER and TOOL GRINDERS
10"x30"; 10"x24"; 8"x16"

COVEL PRECISION GRINDERS

BENTON HARBOR, MICHIGAN

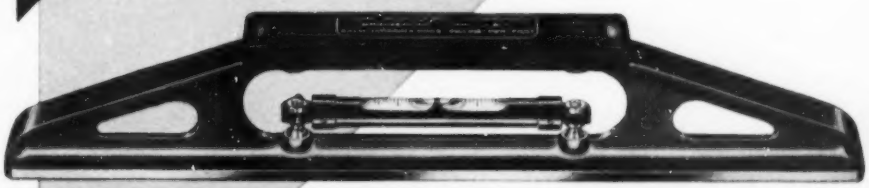
DRILL GRINDERS • UNIVERSAL CUTTER & TOOL GRINDERS • HYDRAULIC & HAND FEED SURFACE GRINDERS

When PRECISION COUNTS

You Can Count on a BULLARD Precision Aligning Level

Today's high standards of machining accuracy make it imperative that the machine is maintained level at all times. Among the innumerable factors that work against this condition are constant vibration, settling of buildings and floors and the molecular changes of cast iron and steel. Increase the life of machines — lower maintenance cost — by using a Bullard Precision Aligning Level.

Available in 18" and 21" sizes



Check these Features

1. The vial used is made of the best optical glass, specially ground, and is filled and guaranteed by one of the greatest Level Makers in the world.

2. The vial is mounted on two brass studs, which permit of adjustments in the same manner as the Level Vials on the finest surveying instruments.

3. The Bubble in the Vial has a guaranteed sensitiveness of 5 seconds of arc per graduation. This is equivalent to showing per graduation on Vial a variation of .0003 of an inch per foot.

4. The Level Casting is thoroughly insulated from the palm of the hand by means of a handle of special non-conductive material.

5. The design is the result of long experience. The casting has been seasoned, machined and scraped with meticulous care.

6. The Levels are made in two sizes, 18-inch and 27-inch, which covers the requirements for leveling all types of machines.

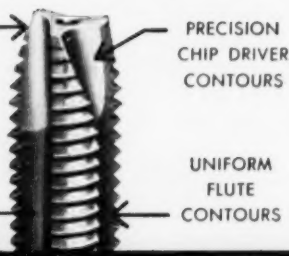
7. This Precision instrument is safely protected in a felt lined box.

THE BULLARD COMPANY *Telephone 6-2511*
BRIDGEPORT 2, CONNECTICUT

Special Application Taps from Winter

are engineered and made from start-to-finish to perform their specific work. They are *not* "altered" stock taps . . . Like all Winter products, these Special Application Taps have

BALANCED Action



WINTER TAPS FOR SPECIAL APPLICATIONS include such items as: Spiral Fluted Taps, Fluteless Chip Driver Taps, and various tap designs for special materials.

ALWAYS AT YOUR SERVICE
There's an industrial supply distributor near you who stocks a complete line of WINTER Balanced Action Taps.

WINTER BROTHERS COMPANY
Rochester, Michigan, U.S.A. Distributors or principal cities. Branches in New York, Detroit, Chicago, Dallas, San Francisco.
Division of National Twist Drill & Tool Co.

WINTER

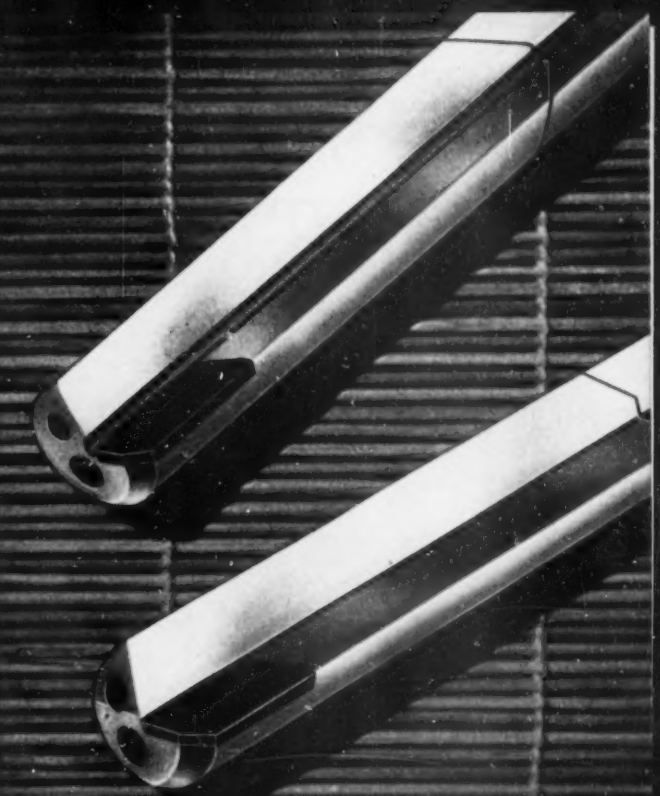
To Make Long Holes Straight and True

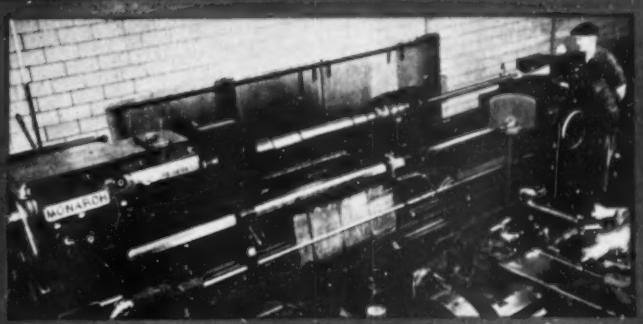
When you have a part that calls for straight-and-true holes, National's TARGET* and CENTERCUT GUN DRILLS will give you alignment and finish. In many cases, these tools are producing the holes as specified with no further finishing, in a single operation.

NATIONAL TWIST DRILL AND TOOL COMPANY

Rochester, Michigan, U.S.A. Distributors in principal cities. Factory Branches: New York • Detroit • Chicago • Dallas • San Francisco

*Patented



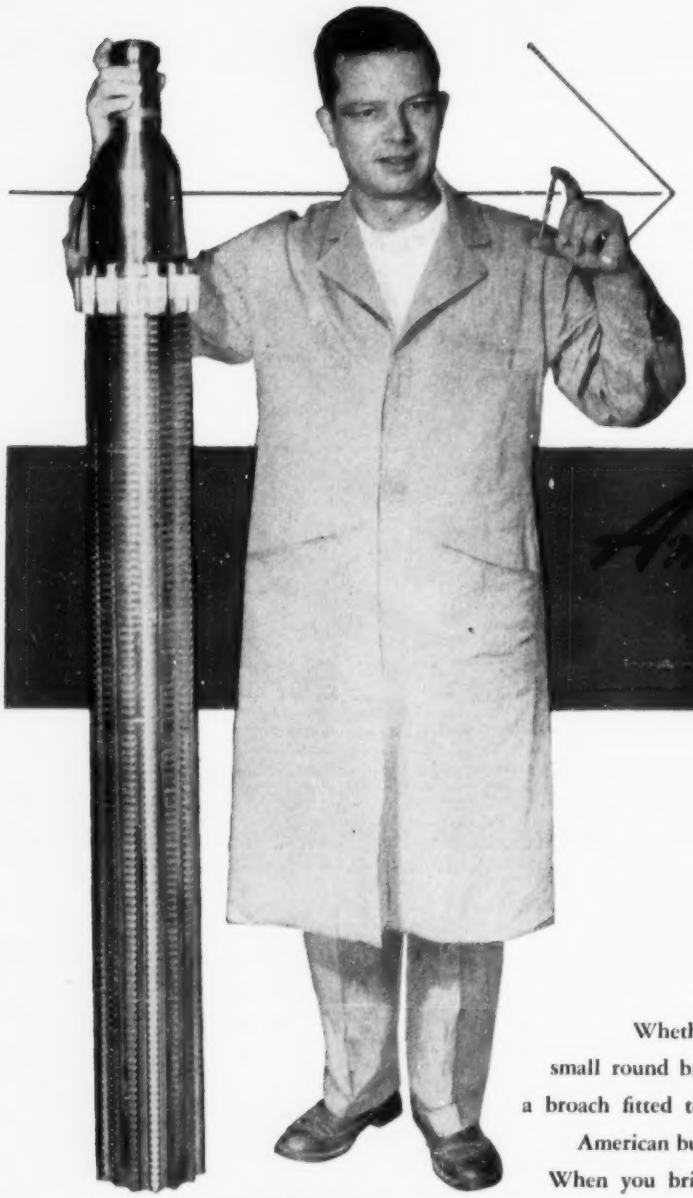


Producing straight-and-true holes in Monarch Lathe Spindles, with National Target Gun Drills.

ASK YOUR INDUSTRIAL SUPPLY DISTRIBUTOR about National's new concept of straight-and-true deep hole drilling—or send specifications of your work to National in Rochester.

NATIONAL TWIST DRILL & TOOL ROCHESTER, MICH. U.S.A.

National



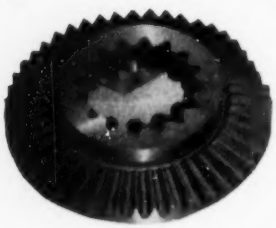
what size broach do you need ?

American HAS THE ANSWER

American **makes all three —**
Broaches, Fixtures, Machines

Whether it is a large involute spline broach or a small round broach, you stand a better chance of getting a broach fitted to your needs when you specify American. American builds all three — tools, fixtures and machines. When you bring your broaching problem to them they approach it from the over-all view.

For American's quotation on your broaching problem, send a part-print and hourly requirements today.



AMERICAN

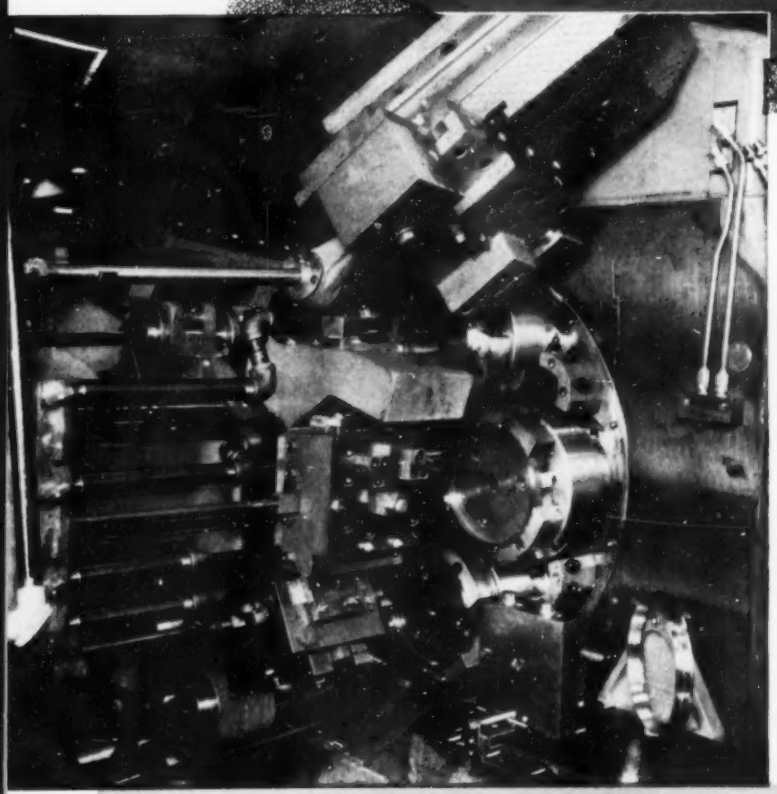
American **BROACH & MACHINE CO.**
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

American Building - Ann Arbor, Michigan

SUNDSTRAND

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

ACME-GRIDLEY CHUCKERS take the TOUGH JOBS



This 8" Combustion Chamber Flange for jet engines is no job to be fooled with.

Machined from 8" diameter stainless steel blanks as shown, it presented first the problem of removing a lot of metal FAST—321 stainless is a difficult metal for precision results.

Tooling for accuracy and finish included both roughing and finish taper turning and boring attachments for the special angles and for holding the thin wall within .008 without danger of collapsing the piece.

All 13 operations were performed on the 10" Acme-Gridley Model RPA 6-spindle fully automatic Chucking Machine with carbide tipped tools at a net output rate *more than 6 times faster* than was possible on the turret lathe method formerly used.

Performances like this have demonstrated to the owners of more than 45,000 Acme-Gridley bar and chucking automatics that design rigidity and tooling ingenuity are your best insurance for sound production and profitable end results.

Acme-Gridley Chucking Automatics are built in 4, 6 and 8-spindle models with capacities ranging from 5¼ to 12".

★ **Ask for guaranteed figures on your work—Tough jobs or otherwise.**

JOB FACTS:

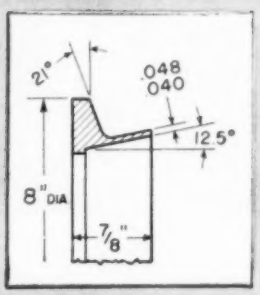
PART—Jet Combustion Chamber

SIZE—8" Diam., ⅞" long

MATERIAL—Type 321 Stainless Steel

OPERATIONS—13, all with Carbide Tools

MACHINE TIME—1 minute, 16 seconds



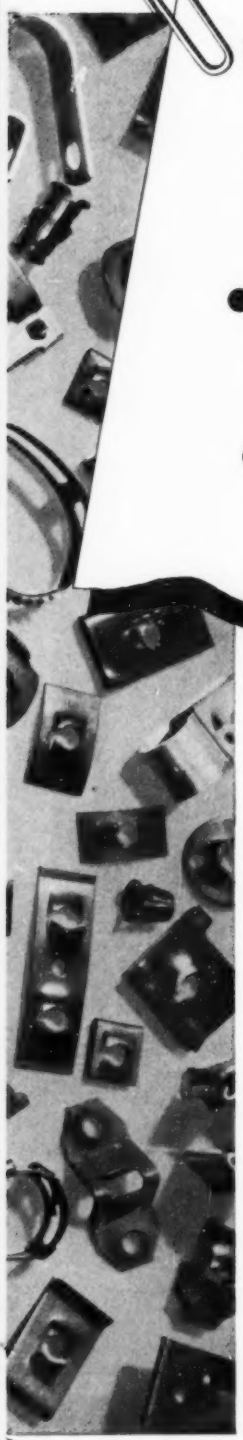
The NATIONAL ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics, 1-4-6 and 8 Spindle—Hydraulic Thread Rolling Machines—Automatic Threading Dies and Taps—Limit, Motor Starter and Control Station Switches—Solenoids—Contract Manufacturing

how Tinnerman Products solved

a tough heat-treating problem:



with **Gulf Super-Quench**

- minimum hardness was increased from 50 to 60 RC
- variation in hardness was reduced from ±5 to ±2 RC

on AISI C-1064 STEEL

Tinnerman Products, Inc., Cleveland, Ohio, manufactures a large variety of spring clips and spring fasteners of the type pictured at the left. These parts range in thickness from .01 to .062 inches and are all made of AISI C-1064 spring steel.

Normal heat treating practice calls for heating to 1600 deg. F. in a controlled atmosphere. The parts are held at this temperature for approximately ½ minute, then are transferred by a shaker-type conveyor into the quenching bath, which is held at 120 to 125 deg. F. After quenching, the parts are tempered at 700 deg. F.

When Tinnerman used a conventional quenching oil, hardness varied from 50 to 60 RC—too low and too variable for suitable performance characteristics. Examination of the steel revealed that in all cases it was within specification limits.

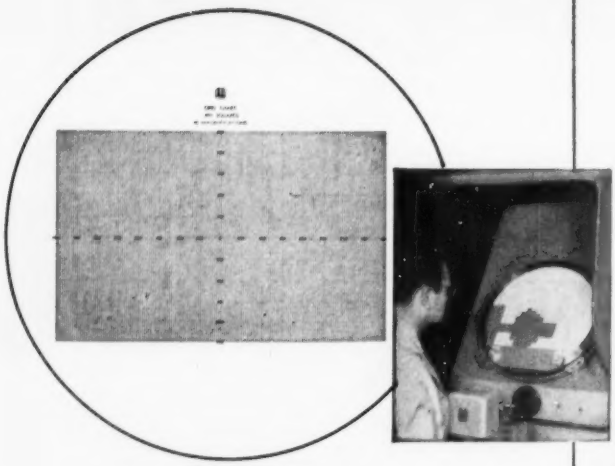
After investigating a number of other quenching oils, Tinnerman Products discovered one that is outstanding—Gulf Super-Quench. Tinnerman Products is now quenching all of these parts in Super-Quench with remarkable results. Hardness is never lower than 60 RC and averages 62 ± 2. This improvement was obtained without any change in quenching temperature, degree of agitation, analysis, or grain size.

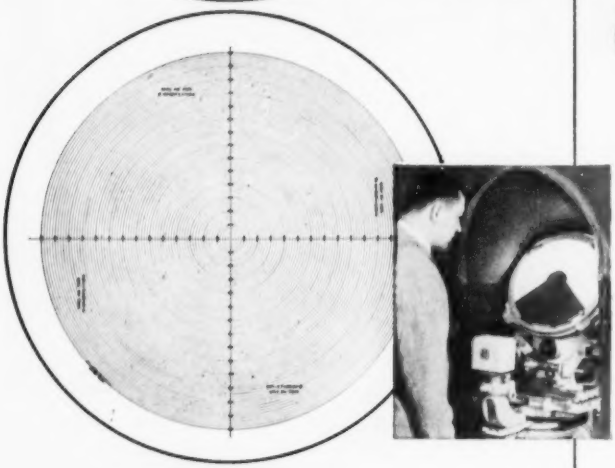
If you, too, are looking for ways and means to increase the efficiency of your quenching operation, it will pay you to investigate the advantages of Gulf Super-Quench. Write, wire, or phone your nearest Gulf office.

Gulf Oil Corporation · Gulf Refining Company

Pittsburgh 30, Pennsylvania

GULF SERVES INDUSTRY





YOU CAN CHECK IT FASTER

with Precision Made Jones & Lamson

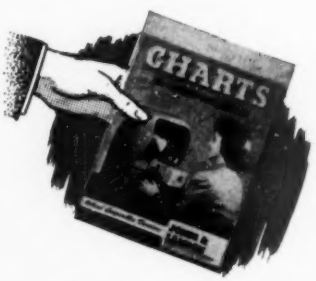
Comparator Charts

With these charts many ***Difficult Inspection Operations Become Routine Jobs.***

They are ***Invaluable Accessories*** that ***Add*** to the ***Economy*** and ***Versatility*** of the ***Comparator.***

Top Quality Materials, Expertly Processed, assure ***Uniform Density*** of ***Lines*** and provide ***Maximum Contrast Between Outline And Image.***

Made To Precision Standards Of Accuracy established during more than ***30 Years Of Specialized Optical Experience.***



Write to Dept. 710 for your copy of our Chart Catalog No. 471.

JONES & LAMSON

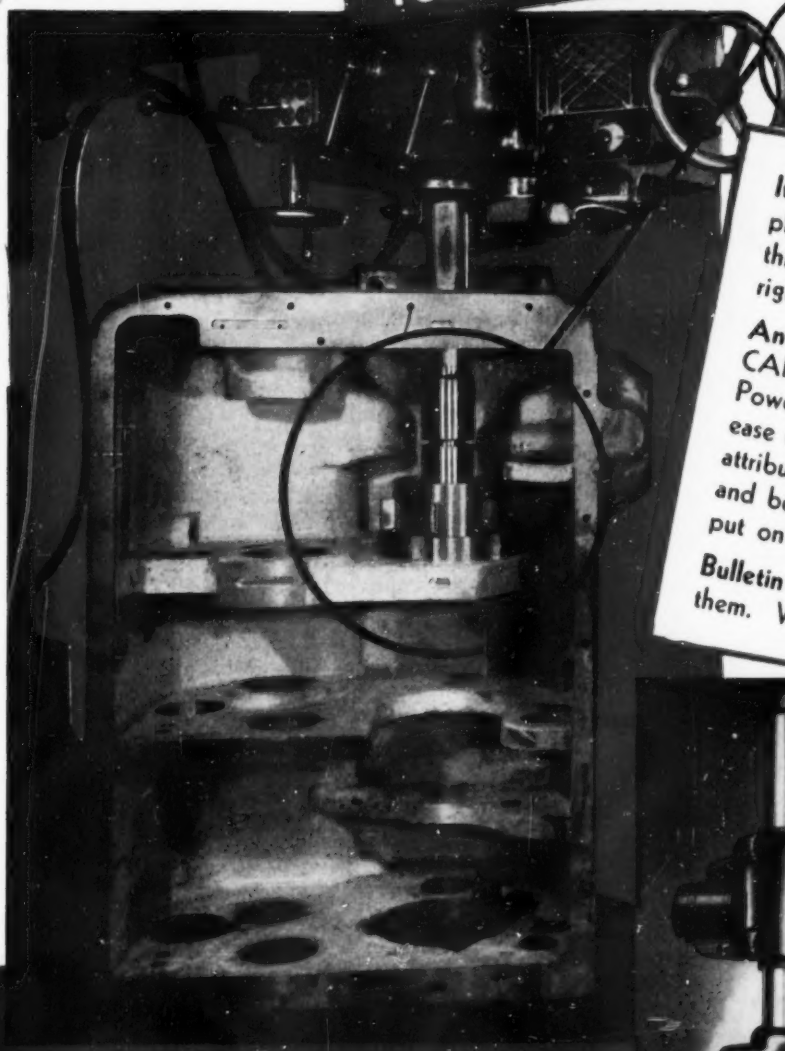
Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., 502 Clinton St., Dept. 710, Springfield, Vt., U.S.A.

OPTICAL COMPARATOR DIV.

A GOOD SPINDLE

FOR GOOD BORING AND TAPPING . . .

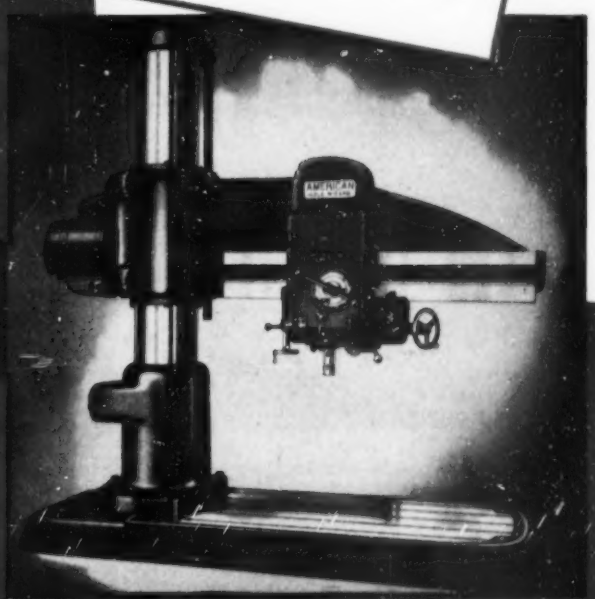


Here's a 10" tapping job on a 5-foot "AMERICAN" Hole Wizard Radial

It takes a sturdy, rigid machine with plenty of power to do work like this. Especially does it require a rigid and smooth-acting spindle.

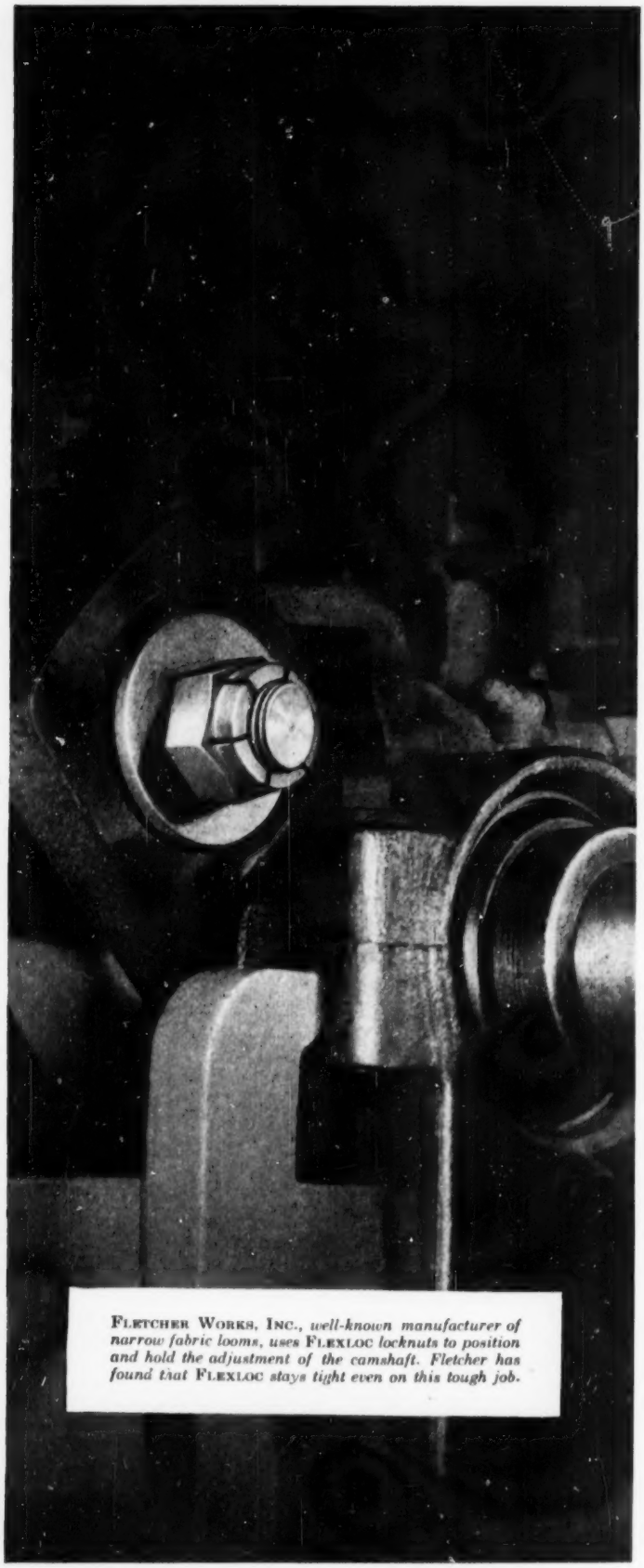
And that's exactly what "AMERICAN" Hole Wizards are noted for. Power—rigidity—convenience and ease of control are "AMERICAN" attributes that cut drilling, tapping and boring costs wherever they are put on the job.

Bulletin No. 327 tells all about them. Want one?

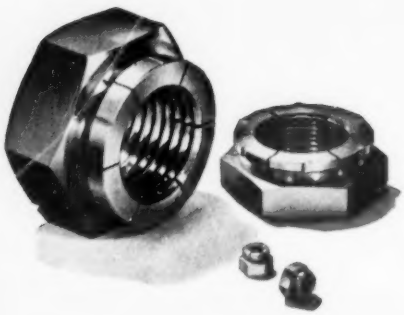


THE AMERICAN TOOL WORKS CO. **Cincinnati.Ohio U.S.A.**

Lathes and Radial Drills



FLETCHER WORKS, INC., *well-known manufacturer of narrow fabric looms, uses* FLEXLOC *locknuts to position and hold the adjustment of the camshaft. Fletcher has found that* FLEXLOC *stays tight even on this tough job.*



How FLEXLOC locknuts reduce maintenance

FLEXLOCs reduce maintenance by staying where you put them. Once they are installed, you can forget them. Service and inspection periods can be stretched safely from days to weeks.

And FLEXLOCs eliminate complicated, time-consuming methods of locking threaded fasteners. They offer faster, simpler application, and safer, more dependable locking than plain nuts and lockwashers, castellated nuts and cotter pins, or nuts and jam nuts.

Use FLEXLOCs wherever you use an ordinary nut. These one piece, all metal locknuts—with nothing to assemble, come apart, lose or forget—won't work loose regardless of the vibration encountered. Yet they can be easily removed and used over and over again. FLEXLOCs are stop and lock nuts too. They don't have to seat to lock, and they stay put anywhere on a threaded member as soon as the locking threads are fully engaged.

You can get FLEXLOCs in a wide range of sizes in any quantity. Stocks are carried by leading industrial distributors everywhere. Write for literature and samples. SPS, Jenkintown 1, Pa.

FLEXLOC®

LOCKNUT DIVISION

SPS

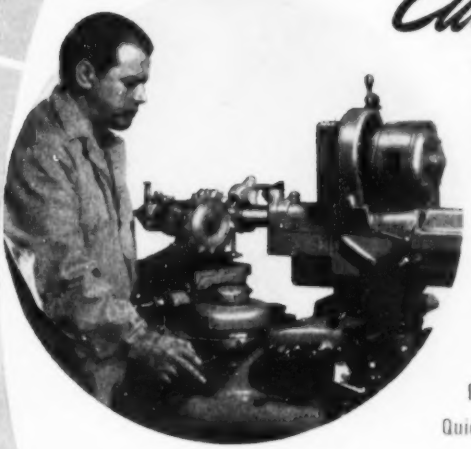
JENKINTOWN PENNSYLVANIA

Our Fiftieth Year : A START FOR THE FUTURE

GIVE YOUR CUTTING TOOLS THE EDGE

WITH A

PRATT & WHITNEY *Cutter and Radius* GRINDER



RADII, ANGLES or TANGENTS . . . STRAIGHT or TAPERED FLUTES . . . SQUARE, RADIUS or BALL ENDS — Grind Them Quickly, Economically, Accurately

Today's high speed machines require sharp, accurately ground cutting tools for efficient production. A Pratt & Whitney Cutter and Radius Grinder will give you longer tool life, faster stock removal and lower tooling costs.

Practically every type of cutting tool — stock or special — can be ground quickly and economically. Difficult jobs like grinding accurate ball and radius noses on end mills are handled with speed and ease. To assure flute uniformity and concentricity, all tools are ground from the shank — and not from centers.

The P&W Cutter and Radius Grinder is expertly designed for ease of operation and is ruggedly constructed of the finest materials for a long, accurate life under hard, constant use. Two sizes grind flute lengths up to 4½" and 10" respectively. Mail coupon for complete information.

PRATT & WHITNEY

DIVISION NILES-BEMENT-POND COMPANY

WEST HARTFORD 1, CONNECTICUT, U.S.A.

First Choice P&W *for Accuracy*

PRATT & WHITNEY — Div. Niles-Bement-Pond Co.
11 Charter Oak Blvd., West Hartford 1, Conn.

Gentlemen: Please mail my free copy of the P&W Cutter and Radius Grinder Circular No. S-455-7.

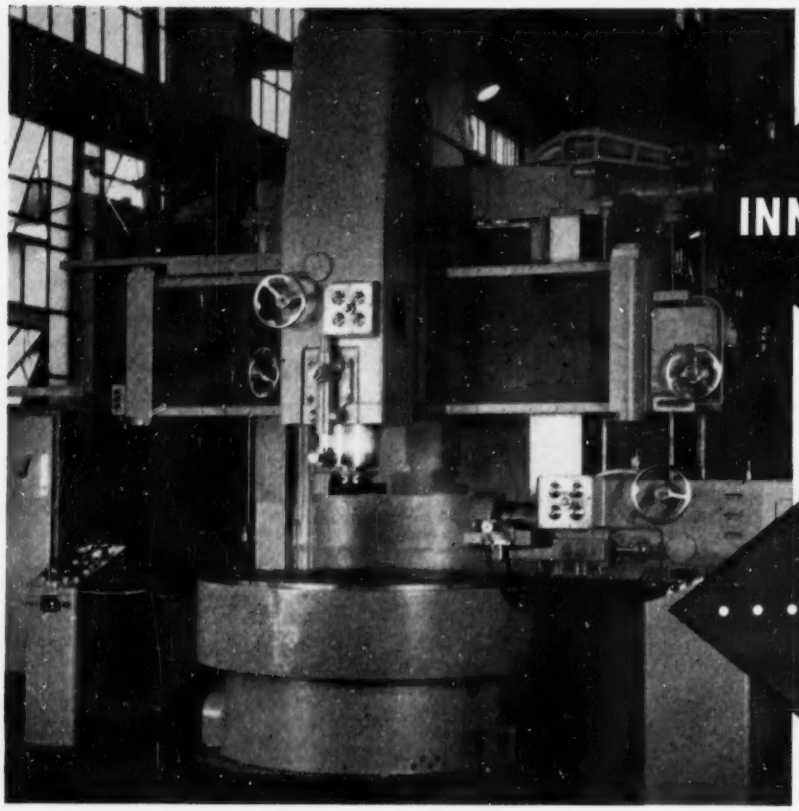
NAME _____

POSITION _____

COMPANY _____

CO. ADDRESS _____

CITY _____ ZONE ____ STATE _____



AN INNOVATION *in*

VERTICAL CHUCKING GRINDING MACHINES

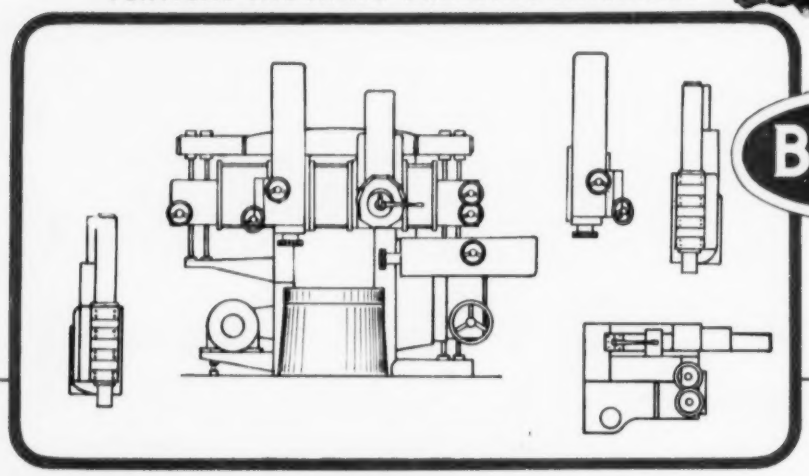
Your Grinding Jobs finished . . . Keep the Machine Paying Its Way . . .

NOW . . .
Practical Versatility

BY . . .
Grinding, Boring, Facing or Turning with several head combinations available.

ASSURED
Sufficient horsepower for regular machining cuts first . . .
Grinding work next . . . on the SAME machine.

POSSIBLE HEAD COMBINATIONS on BULLARD
VERTICAL CHUCKING GRINDING MACHINES

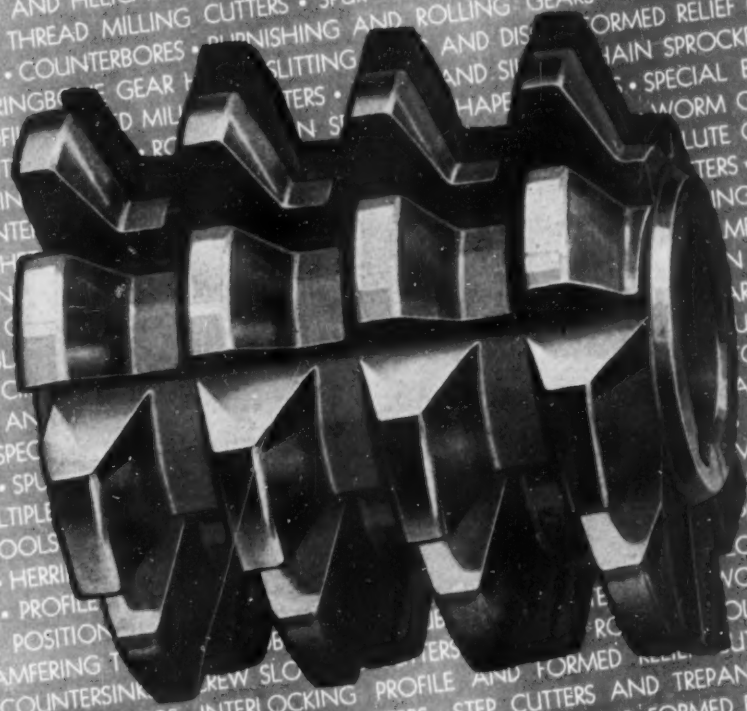


THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT

FOR THOSE TOUGH *Special* JOBS

...DEPEND ON

National Tool Co.



● Years of successful experience in *special* tooling and related production problems are yours for the asking. When the job requires *special* cutting tools call in your National Tool Co. representative. He is backed by more than 46 years experience in the engineering and manufacture of *special* cutting tools. His assistance is yours, without obligation, whether you're interested in one tool or a complete tooling program.

Since 1905 engineers and manufacturers of high-quality special cutting tools for the metal-working industry

National Tools Cleveland

National
TOOL CO.
Cleveland 2, Ohio

ARMSTRONG WRENCHES

Choose Your Wrenches as you do your friends--for life

Specify ARMSTRONG Wrenches for lifetime service, for finely balanced tools that feel right in the hand and make work easier, faster and less fatiguing. ARMSTRONG Wrenches generally are longer for size—give greater leverage. Accurately milled or broached openings give the proper clearance. They are safe wrenches because they are strong beyond need.

Drop forged and machined from high tensile carbon or special alloy tool steels, ARMSTRONG Wrenches are heat treated, tempered and tested to an exact balance of toughness, hardness and tensile strength. Each is beautiful in finish and line, is a quality tool to be proudly possessed by any mechanic—or certain to "give a lift" to any assembly line. Buy wrenches which carry the trade marks HI-TEN or ARMALOY. On carbon or alloy steel wrenches these trade marks are your guarantee of lifetime quality.

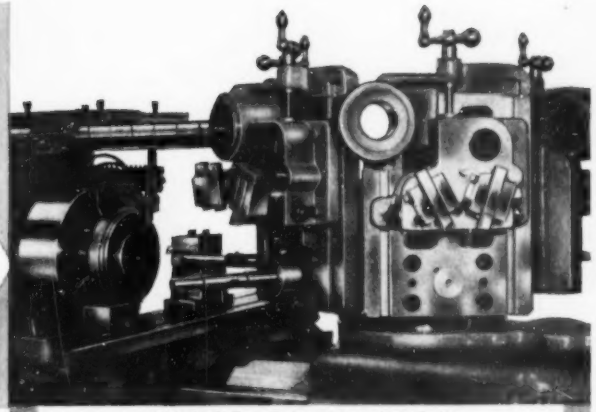
WRITE FOR CATALOG

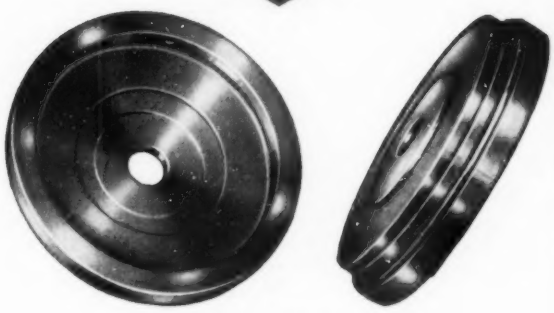
ARMSTRONG BROS. TOOL CO. *"The Tool Holder People"* 5215 W. ARMSTRONG AVENUE CHICAGO 30, ILL.

POTTER & JOHNSTON *Engineering*

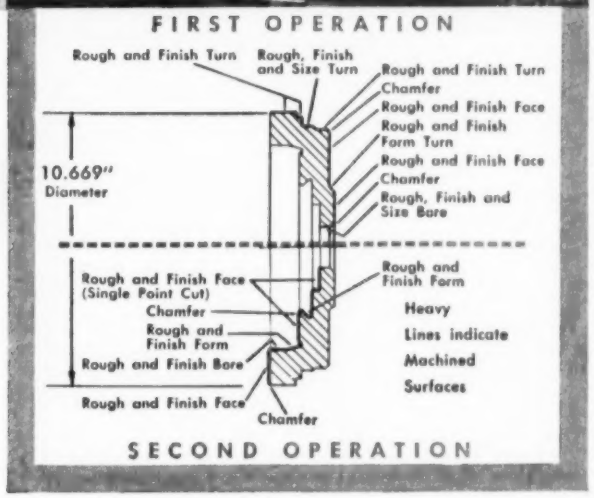
HERE

PAYS OFF HERE





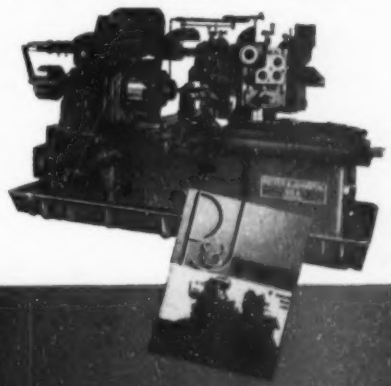
MALLEABLE IRON FLYWHEEL



YOU'LL PRODUCE MORE PIECES MORE ACCURATELY at LOWER COST with P&J TOOLING on a P&J AUTOMATIC

Tooling expertly engineered to the job by Potter & Johnston Specialists assures the best possible combination of machining operations and sequence for fast, accurate, low cost production. Unnecessary handling is eliminated, combined cuts minimize machining time. And when P&J Tooling is put to work on an accurate, powerful, versatile P&J Automatic Turret Lathe — like the 5D Power-Flex shown here — the result is really profitable production on even your toughest jobs.

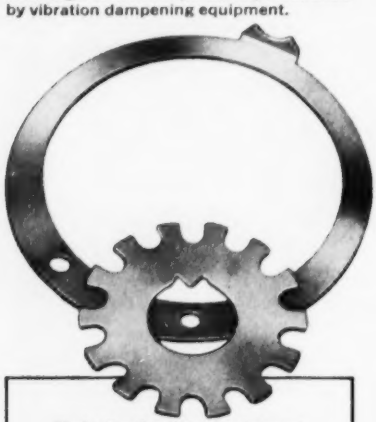
For complete information, send today for your copy of the 5D Power-Flex Bulletin No. 131 — and ask the P&J Tooling Engineers to submit recommendations based on your prints or sample parts.



POTTER & JOHNSTON CO.
PAWTUCKET, RHODE ISLAND
SUBSIDIARY OF
PRATT & WHITNEY
DIVISION NILES - BEMENT - POND COMPANY

P&J

Half-dollar stands on edge on bolster of 100-ton Henry & Wright Dieing Machine producing stampings at machine speed of 100 strokes per minute. Minimum vibration of Dieing Machine was practically eliminated by vibration dampening equipment.



Projection height on switch part held to .001"

Meat cutter blade held to total concentricity of .002"

TEN TIMES AS MANY STAMPINGS BETWEEN GRINDS with H&W DIEING MACHINE

reports Wallace Barnes, Division of Associated Spring Corporation

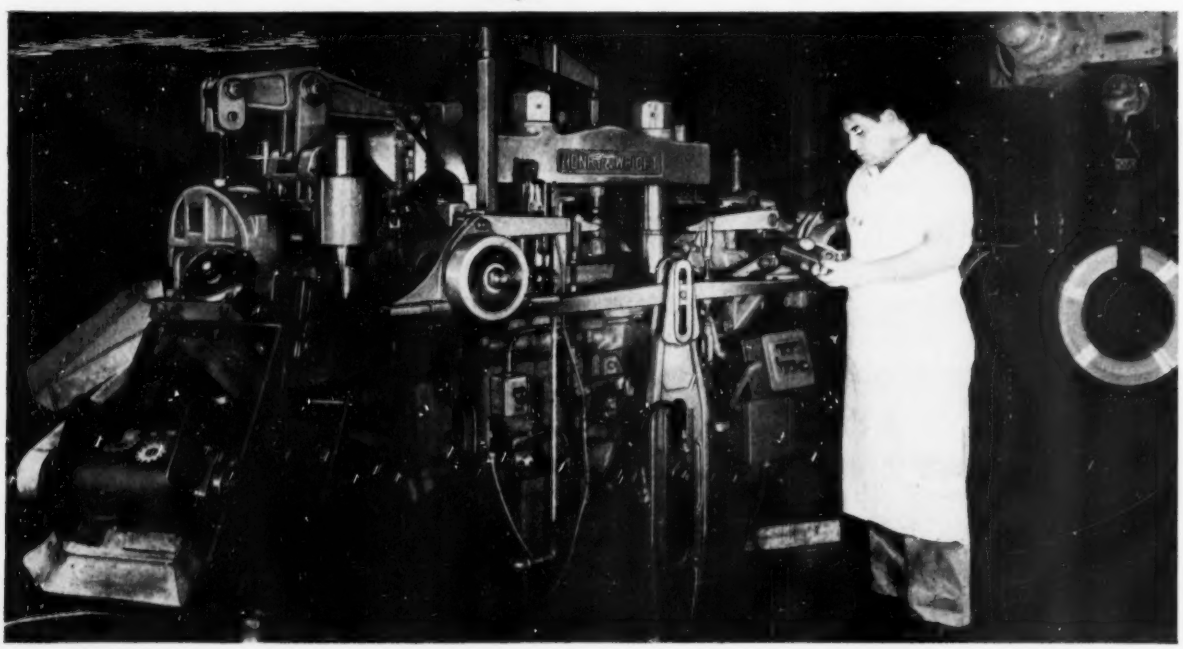
Using a conventional press, Wallace Barnes obtained 7,000 to 10,000 pieces between grinds. Running the identical part on a Henry & Wright Dieing Machine, Wallace Barnes got 70,000 pieces and completed the order. And the die still did not require sharpening.

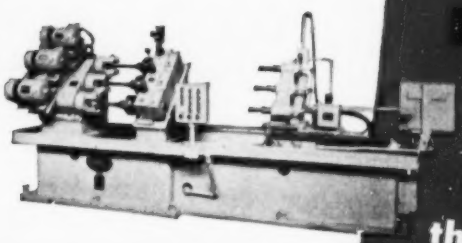
Features about the Dieing Machine which impressed Wallace Barnes were: rigidity and accuracy; fact that heavy loads can be applied any place in the die and not just in the center; fact that the machine can be started and stopped at any point during the work without removing and then relocating the strip material; safety devices which permit stopping the press almost instantaneously.

If you're looking for ways to get more mileage out of your dies, more completed pieces per minute and better work quality, get the full story on Henry & Wright Dieing Machines. You'll see why they deliver a price cut with every stroke.

For 1953 Catalog, write Henry & Wright, Division of Emhart Mfg. Co., 481 Windsor St., Hartford, Conn.

HENRY & WRIGHT
DIVISION OF EMHART MFG. CO.
HARTFORD, CONN.

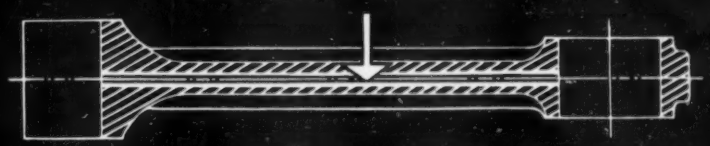




DRILLING 5/16" HOLES UP TO 14½" DEEP

through 3 connecting rods at one time!

5/16" oil holes drilled through connecting rods from 12¼" to 14½" deep.



THIS NATCO FEATURES—

FLEXIBILITY—Performs operations on 3 of any one of seven different sizes of diesel engine connecting rods.

TYPE OF TOOL—Oil tube type gun drill held stationary.

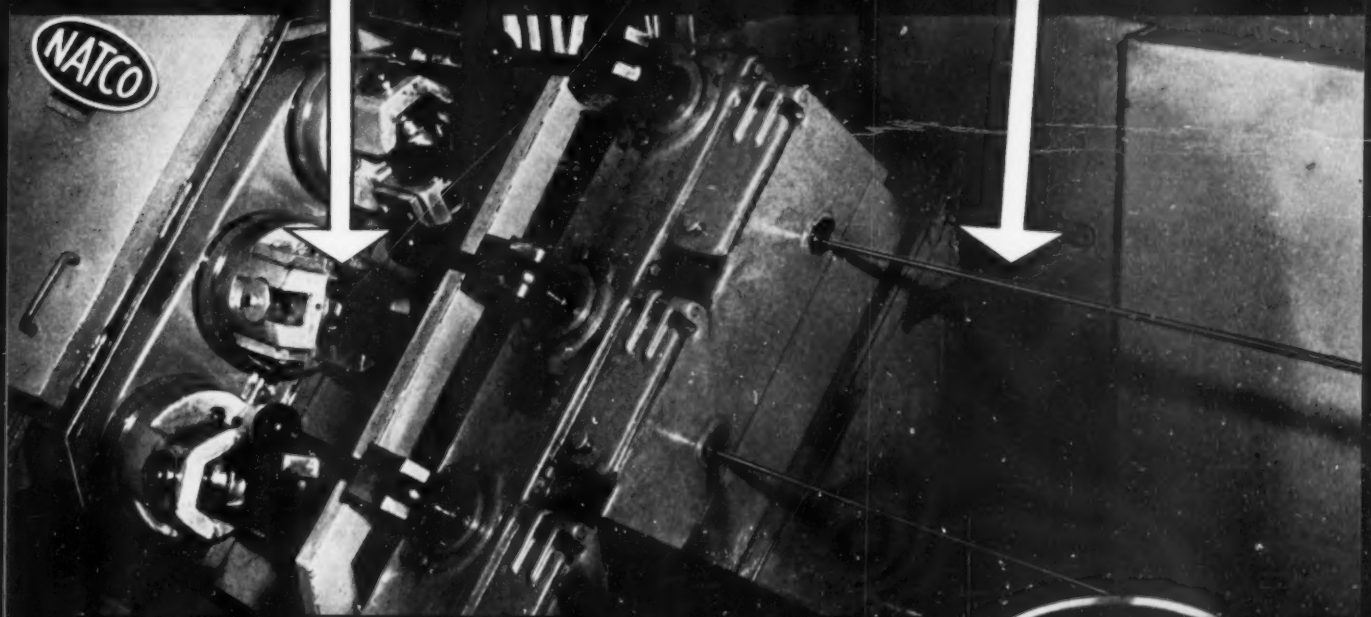
FIXTURE—Three rotating type holding units.

DEPTH OF HOLES—Holes vary from 12¼" to 14½" depth.

COOLANT—High pressure coolant through drills to remove chips.

SAFETY—Torque overload is provided for tool protection.

PRODUCTION—Approximately 8 parts per hour.



Call a Natco Field Engineer

to help you solve your problems in Drilling, Boring, Facing and Tapping.

NATCO

NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana

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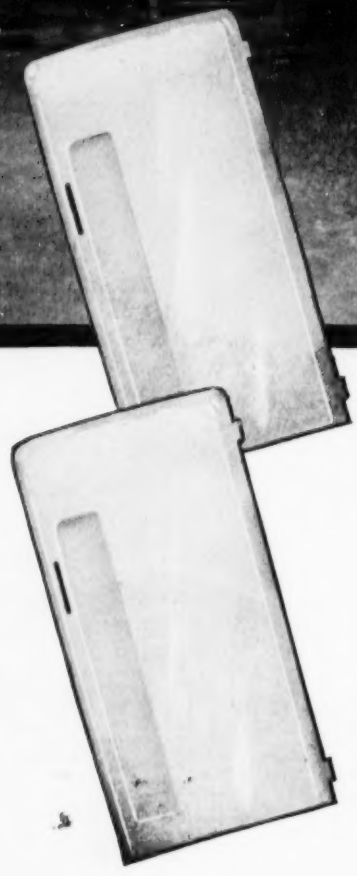
STANOIL
TRADE MARK
Industrial Oil



Cutting hydraulic maintenance on...

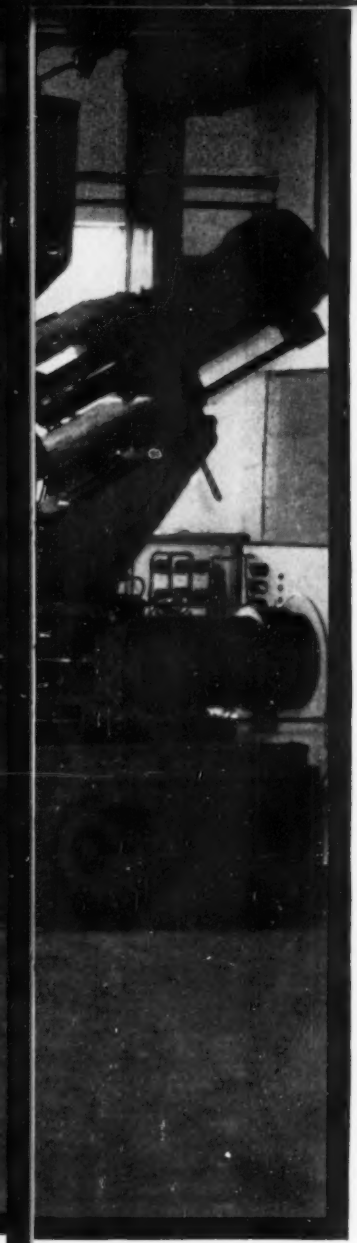
operation big squeeze

• Shown above is one of the world's largest injection molding machines, recently installed by the General Machine Tool and Die Company, Walled Lake, Michigan. The machine has a 1500-ton clamp, a plasticizing capacity of more than 300 pounds of material per hour, and can accommodate molds as large as 4 x 6 ft. in size.

The General Machine Tool and Die Company, a pioneer of the injection molding process of plastic forming, uses the new giant injection machine to produce refrigerator door panels. Forming one entire panel per injection, this Operation "Big Squeeze" pioneers another important advance in injection molding.

In the hydraulic system of this great machine, as in ten other injection presses operated by the General Machine Tool and Die Company, STANOIL Industrial Oil has played a significant role. Withstanding severe conditions of heat and pressure, STANOIL has kept hydraulic systems clean and permitted efficient operation of units at all times. Maintenance has been kept to a minimum.

Find how STANOIL can benefit you by discussing this multi-purpose oil with the Standard Oil lubrication specialist serving your section of the Midwest. Phone your local Standard Oil office. Standard Oil Company, 910 S. Michigan Ave., Chicago 80, Ill.

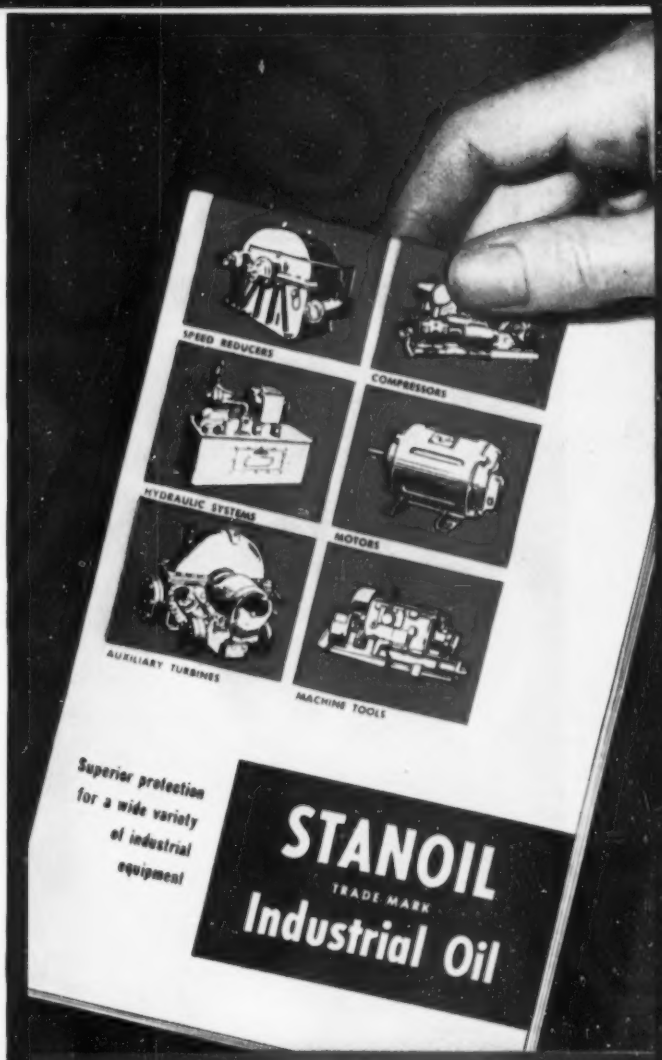


What's YOUR problem?

W. C. Spain, of Standard Oil's Detroit office, has worked closely with the General Machine Tool and Die Company to assure the economical and reliable hydraulic oil performance vital to the operation of this company's injection presses.

Like all Standard Oil lubrication specialists, he has a broad background of practical experience plus thorough training in Standard's own lubrication engineering schools. And like all lubrication specialists, his on-the-job assistance is always available to the industries in the immediate area he serves. He is one of a corps of experienced men who make their headquarters wherever industry is located throughout the Midwest.

For help with your problem, call for the services of your Standard Oil lubrication specialist. Phone your local Standard Oil office.



Send for this booklet

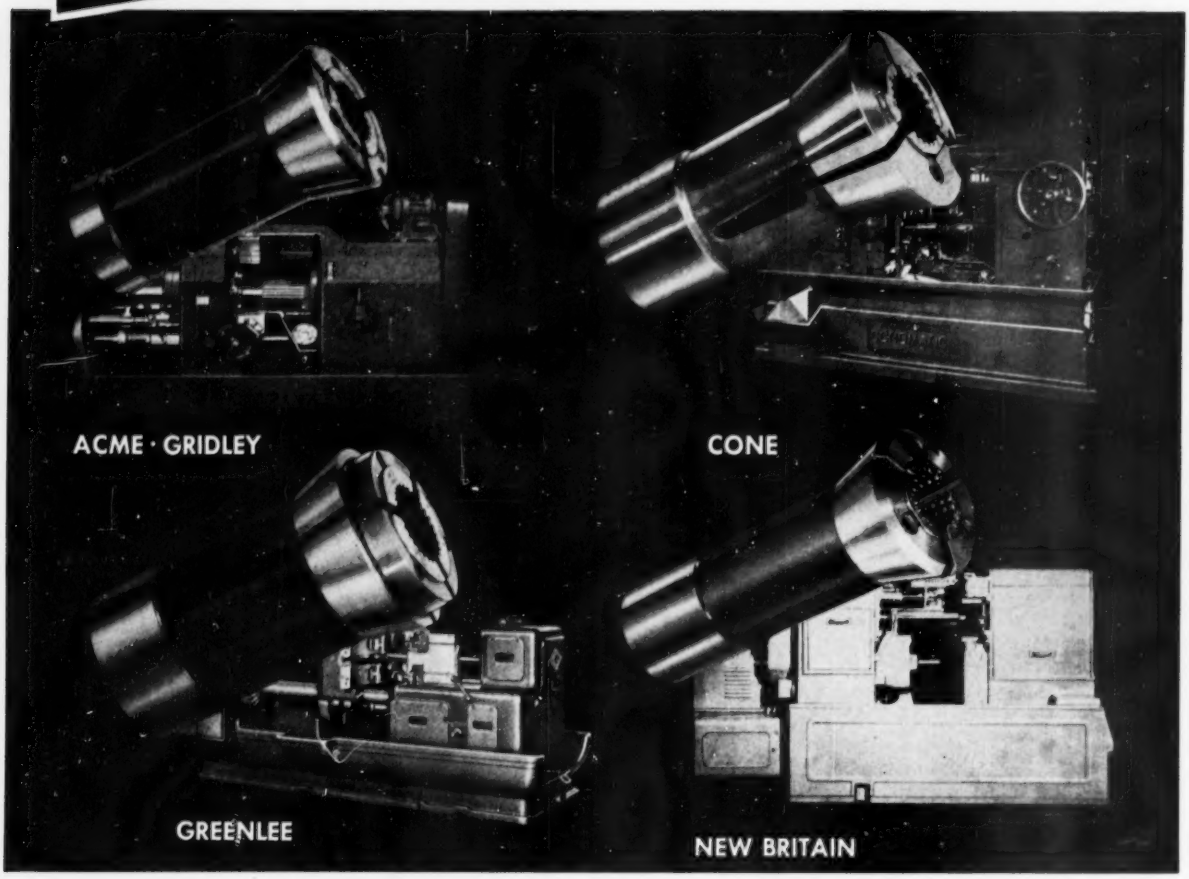
SEE WHAT STANOIL OFFERS YOU

STANDARD

STANDARD OIL COMPANY
(INDIANA)

You'll find the means to significant savings in this booklet. It describes the important qualities of STANOIL Industrial Oil and the resultant benefits which have made this multi-purpose oil the choice of midwest manufacturers for a host of lubricating jobs. Discover how STANOIL will give you superior protection through its unique combination of six outstanding characteristics, including high stability and effective rust prevention. Find how STANOIL can simplify stock, storage, and inventory in your plant by replacing special-purpose oils in a wide variety of equipment. Ask the Standard lubrication specialist from your nearby Standard Oil office for this booklet, or write: Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

HARDINGE ELMIRA, N.Y. Master Collets and Pads for MULTIPLE SPINDLE AUTOMATICS

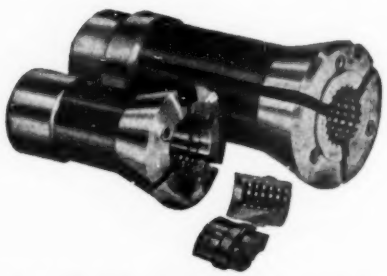


Equip your multiple spindle automatics with HARDINGE Master Collets and Pads—for solid collet performance at low cost.

Available for the following machines up to and including 3½" capacity: Cone; Greenlee; Gridley and Acme-Gridley; National Acme and New Britain.

- Size changes permitted without removing collet from Spindle.
- Final tightening possible for pads when closed on bar stock.
- Lower cost—compare pad price with solid collet, and you will standardize on Hardinge Style "S".
- Design affords maximum strength.
- Greater accuracy — because pads are ground accurately on an arbor.
- Lower inventory possible — pads interchange among different makes of automatics with similar capacity.

Hardinge Style "S" Sure Grip Master Collets and Pads



Write for Style "S" Bulletin—contains complete descriptions, specifications, and ordering information.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

for machining, grinding and presswork

A UNIVERSAL COOLANT-LUBRICANT

GRINDING COSTS CUT 4 WAYS

WITH SHEAR-SPEED SOLUBLE OIL

✓ less down-time

✓ longer wheel life

✓ fewer wheel dressings

✓ more parts per dressing

Convince yourself of the **amazing** advantages and versatility of SHEAR-SPEED Soluble Oil in your own plant. Sold only on a **satisfaction guaranteed** test basis. Write for **Bulletin SO-53** and price list.

IMPARTIAL TEST RESULTS: two highly-rated soluble oils vs. SHEAR-SPEED Soluble Oil tested under similar conditions in actual production of machine tool parts.

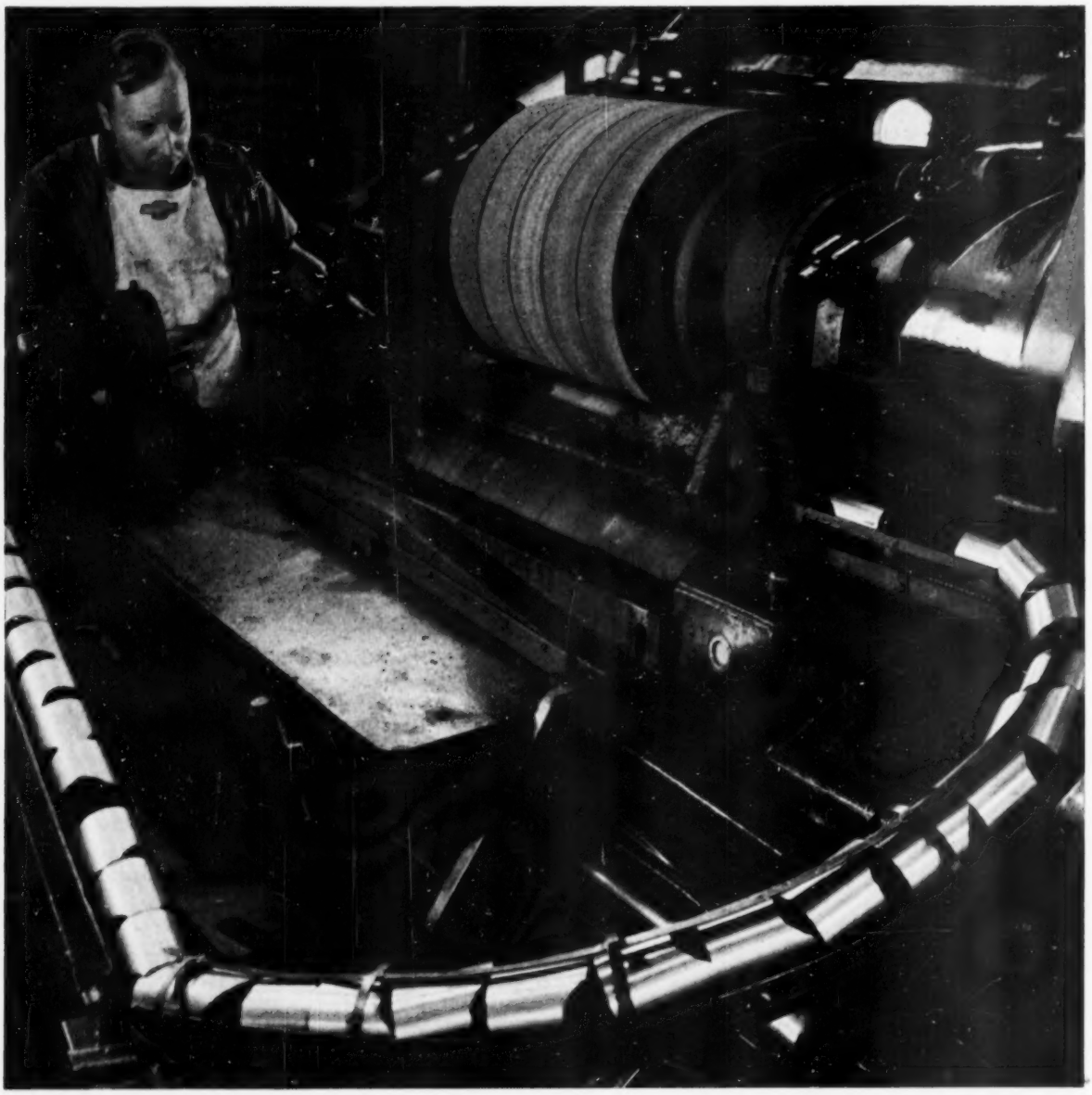
same machine and coolant flow all tests; parts 65 Rockwell C; vitrified 60 grit wheel @ 6280 sfpm.

	Soluble X	Soluble Y	SHEAR-SPEED Soluble Oil	S/S Soluble Oil Gave this:
Wheel Loading	Very Rapid Loading	Rapid Loading	No Loading	55% Increase Depth of Cut
Finish	Finish Grind Required	Finish Grind Required	No Finish Grinding	Lower Cost Per Piece
Coolant Temperature	Rapid Increase	Rapid Increase	Very Slight Increase	Decreased Work Distortion

SHEAR SPEED
CHEMICAL PRODUCTS

7125 E. McNICHOLS RD. *A Division of Michigan Tool Co.* DETROIT 12, MICH.

How can a *'phone call* improve your



CARBO

REGISTERED

CENTERLESS GRINDING?

Find out by calling your CARBORUNDUM *distributor or salesman. Ask him to prove to your satisfaction that* CARBORUNDUM'S *grinding and regulating wheels* **can** *improve production and performance...*

He'll put your grinder to the test...using your operator and the materials you are grinding or lapping. And there are mighty good reasons for his confidence that he *can* show you how to do a better job—as he has done for hundreds of other plants. The wheels he recommends are all *proven-on-the-job.* They're engineered to give you the exact combination of the best abrasive grains and bonds, tested for their ability to do specific grinding jobs on specific materials.

Take armature grinding, for example. CARBORUNDUM engineers have developed a radically different regulating wheel with a specially constructed resilient rubber core. This resilient regulating wheel exerts a light but even pressure on the work. Result? Less grinding pressure, which is the cause of faulty finish on such parts as armatures. Rejects are reduced or eliminated. This is just one example of CARBORUNDUM'S leadership in the field of centerless grinding.

Make the Telephone Call Today!

Call your CARBORUNDUM distributor or salesman—he's listed in the yellow pages under "Abrasives" or "Grinding Wheels." Let him show you how CARBORUNDUM'S grinding and regulating wheels have earned their reputation as "the standard of the industry." Or write The Carborundum Company, Dept. AM 81-315, Niagara Falls, New York.

RUNDUM

RADE MARK

...the ONLY source for EVERY abrasive product you need

81-315

Design Your Own Precision Gaging Fixtures

. . . around this Inexpensive Gage Head Cartridge

Measures by .0001" —.00001"

Compact, shock-proof, and moisture-proof, this Brown & Sharpe Gage Head Cartridge No. 953 gives you a simple means for designing high precision into your own gaging fixtures.

Readings in .0001" to .00001" are taken on the No. 950 Electronic Amplifier. Simply plug the cartridge into the amplifier. You take readings directly from the amplifier's accurately graduated dial . . . only one master required for setting. And you can design cartridges into several fixtures and use the same amplifier on all of them.

The unique design of the cartridge provides simple adjustment, frictionless movement, adjustable measuring pressure, and wide adaptability to many inspection devices, jigs, fixtures, and machines. Write for detailed Bulletin. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

BUY THROUGH YOUR LOCAL DISTRIBUTOR

Brown & Sharpe B·S

Multiple spindle automatic builders do not deny the importance of good frame design. As early as 1920 Cone's revolutionary frame was substantial evidence that Cone did something about it.

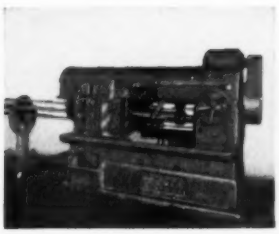
For some time there has been discussion concerning the relative merits of the use of 100% carbide tooling on multiple spindle bar automatics. There has been very little information made available about successful carbide application to this type of machine by its builders or by carbide suppliers. But Cone is doing something about it.

The Conomatic Carbide Development program is accumulating much helpful information for "automatic" users through test runs under production conditions. The illustration is an example of such information applied to an actual production run. Full data is available.

Action speaks better

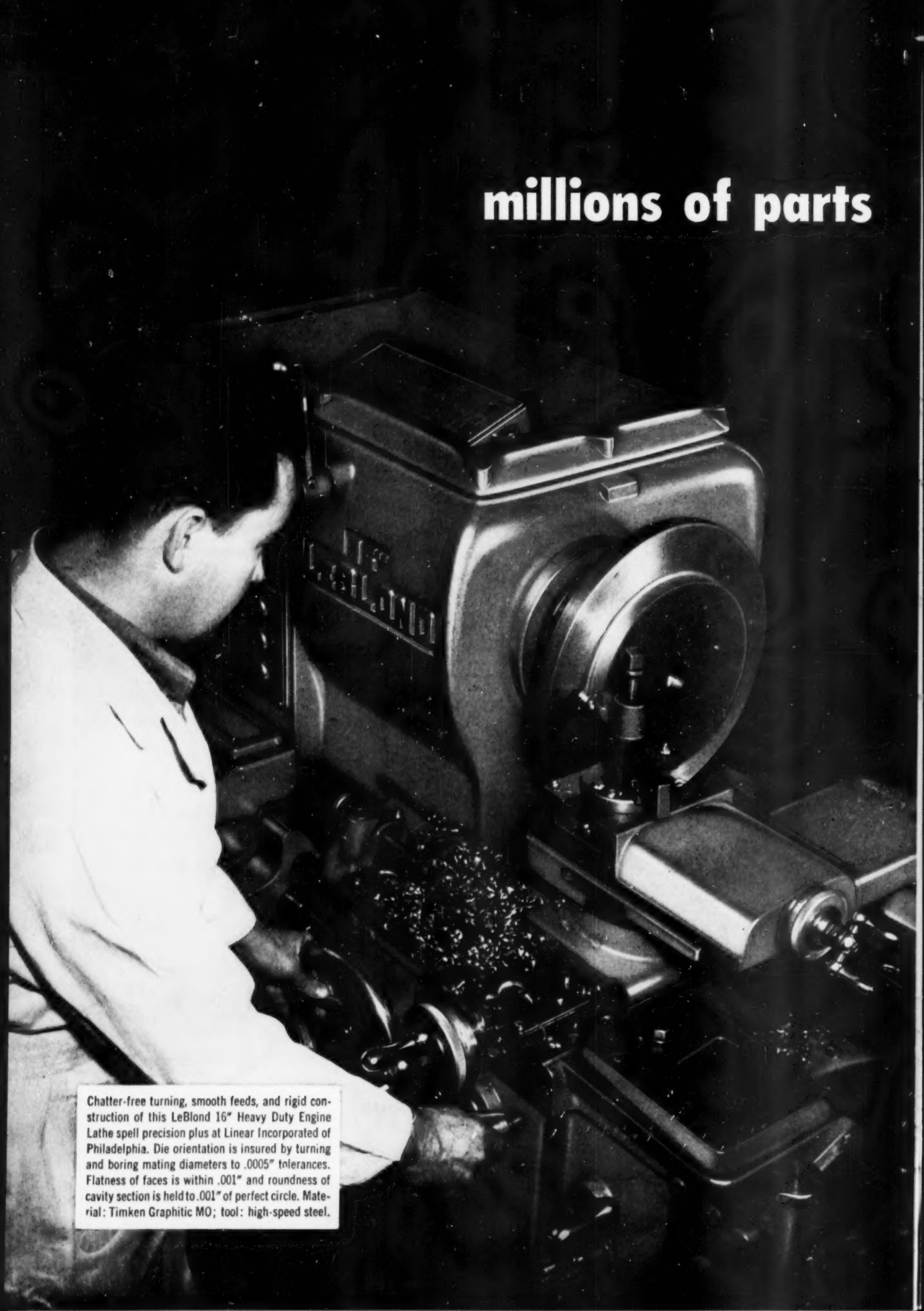
MATERIAL—ALUMINUM: Hole drilled with 1" and 1 1/16" dia. drills to 1½" depth, and tapped to ¾" depth.

	HSS	CARBIDE
Cycle Time	90 secs.	11 secs.
Work Spindle Speed	270 R.P.M. at 104 S.F.	830 R.P.M. at 320 S.F.
Tool Wear	5,000 pcs. per grind	20,000 pcs. per grind



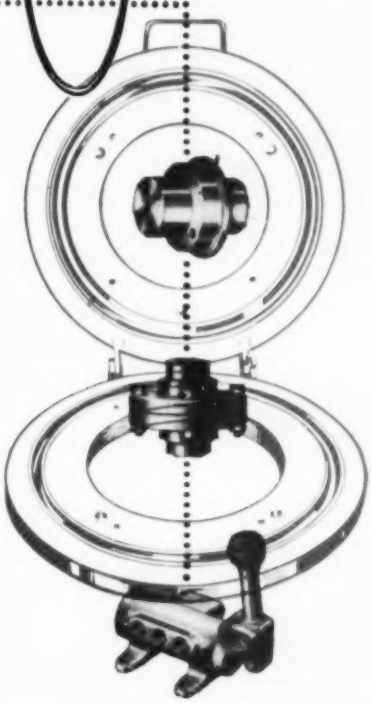
Conomatic } CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

millions of parts



Chatter-free turning, smooth feeds, and rigid construction of this LeBlond 16" Heavy Duty Engine Lathe spell precision plus at Linear Incorporated of Philadelphia. Die orientation is insured by turning and boring mating diameters to .0005" tolerances. Flatness of faces is within .001" and roundness of cavity section is held to .001" of perfect circle. Material: Timken Graphitic MO; tool: high-speed steel.

are married with rings like these



Industry needs sealing rings to "marry" millions of parts against leakage of air, liquid, and gas. Seals, for example, like the rubber "O" rings made by Linear Incorporated of Philadelphia. They're vital to the successful operation of hydraulic mechanisms, air-operated devices, and chemical processing equipment . . . to name just a few applications. And industry says, "Make these sealing rings to precision tolerance for non-leakage. Deliver the millions we need at low cost."

Linear experimented . . . found that "O" rings with the required finish and roundness could be mass-produced easily enough . . . but to turn them out at low cost demanded virtual elimination of hand-finishing operations. The problem called for dies made to tolerances that would deliver cross-sectional roundness conforming to nearly "perfect circle," mating diameters so accurate that perfect die orientation could be achieved.

Then Linear installed their new 16″ LeBlond Heavy Duty Engine Lathe. This profit-building lathe is saving expensive toolroom time and delivering cavity finish on Linear's dies as fine as 10 microinches, mating diameters to the required .0005″ whisker of tolerance, cross sectional roundness within .001″ of perfect circle. Costly die-finishing time at Linear is down . . . flash-removing second operations on "O" rings are at a bone-bare profit-making minimum. It's a case of chatter-free turning, smooth-as-silk feeds, and rigid construction.

LeBlond features like hardened and ground self-compensating steel bed ways, totally enclosed quick-change box, one-piece apron and a host of others will insure Linear a lifetime of this same smooth-turning performance.

Whether you need unfaltering accuracy or high output rapid production, there's a LeBlond lathe that will fill the bill. Your nearby LeBlond distributor will tell you about our complete line. Call him or write

THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

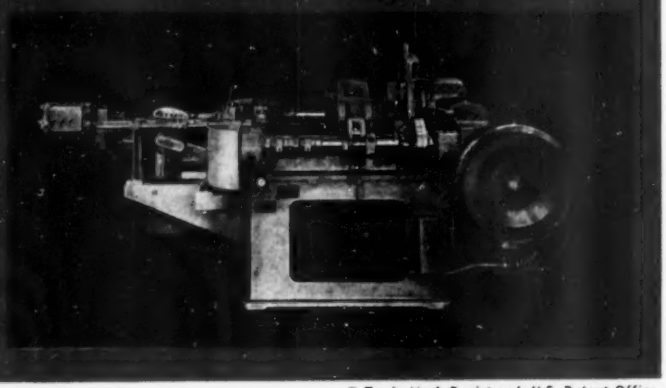
Ask for Bulletin HD125A
for more information on the 16″
LeBlond Heavy Duty Engine Lathe

turned faster by

LeBLOND *of Cincinnati*

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 64 YEARS*

All Produced on U. S. Multi-Slides®!



® Trade Mark Registered, U.S. Patent Office

PRODUCTS

U.S. TOOL COMPANY, Inc.

AMPERE (East Orange) NEW JERSEY

New Thompson AUTOMATIC double wheel TRUFORM Grinder speeds jet engine production

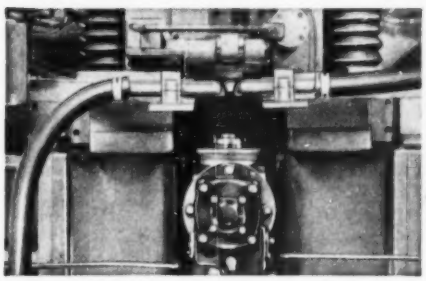
GRINDS BOTH SIDES OF JET TURBINE BUCKETS OR BLADES SIMULTANEOUSLY IN A SINGLE SETTING

To grind root sections on gas turbine buckets with greatest accuracy and productivity, Thompson developed this new AUTOMATIC double wheel TRUFORMING machine featuring simultaneous grinding of both sides of root section with one setting of work.

Grinds rough to finish in 110 seconds . . . or 30 buckets per hour

Hood doors, work clamps, coolant flow, grinding and crushing cycles are actuated in automatic sequence on the new Thompson AUTOMATIC double wheel TRUFORM Grinder.

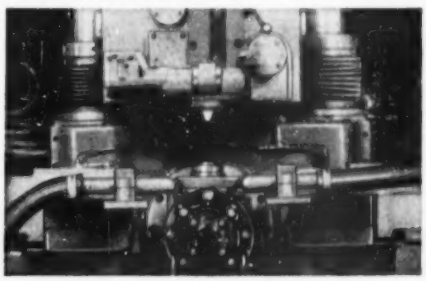
On a bucket having 2" length of form similar in design to the one in the diagram above with .150" stock removal per side from rough to finish size, production is 30 buckets per hour at a steady day after day rate. This includes down time for dressing, regrinding the crusher roll, initial machine warm up period, wheel changing and diamond changing. Actual machine time from rough forging or casting to finish is 104 seconds plus 6 seconds for loading and unloading time . . . makes total time floor to floor 110 seconds per piece.



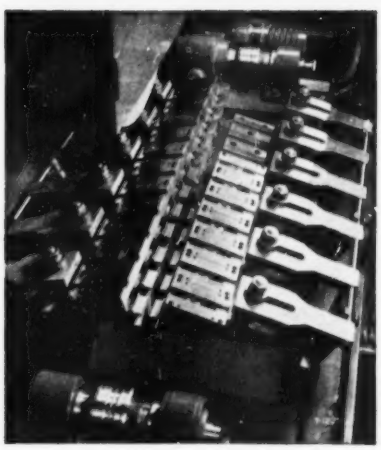
FOR ABSOLUTE SYMMETRY BOTH WHEELS ARE DRESSED FROM A SINGLE CRUSHER ROLL

GRINDING POSITION

CRUSHING POSITION

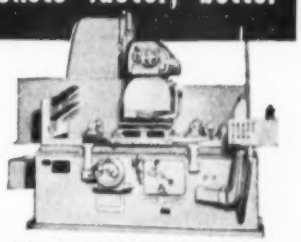


Standard THOMPSON TRUFORM Machines also grind jet buckets faster, better



By means of multiple grinding of jet turbine buckets the standard TRUFORM Grinders still offer high production plus many advantages such as flexibility of standard machine design and lower first cost. Although compared to the new AUTOMATIC the standard TRUFORM requires more skillful set up and tooling.

Typical tooling on Type "C" TRUFORM producing 24 buckets per hour. Type "B" TRUFORM produces 18 parts per hour.

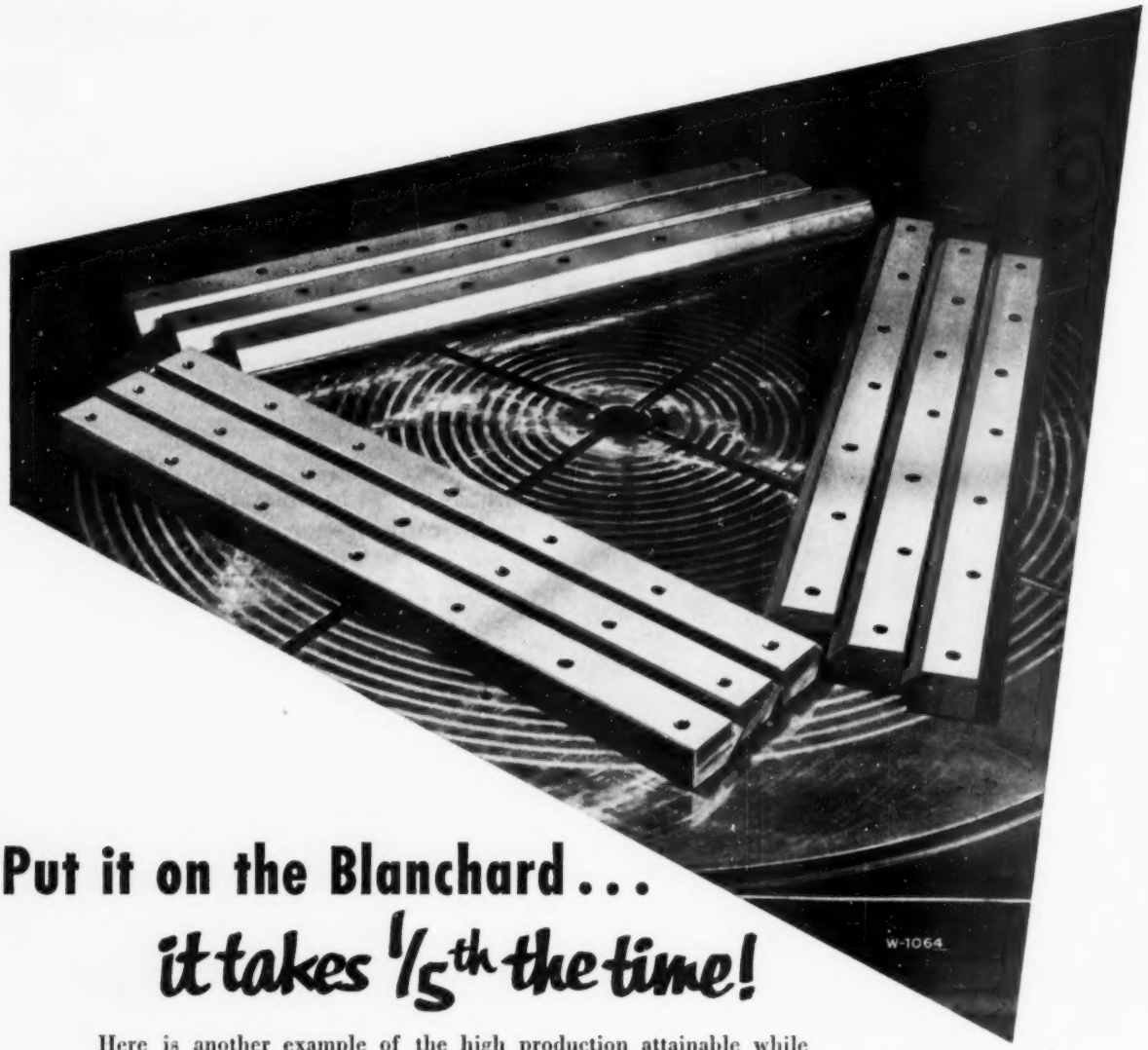


Thompson Type "C" TRUFORM

FOR COMPLETE DETAILS WRITE TODAY

The Thompson Grinder Co.
Springfield, Ohio

Thompson SURFACE Grinders



Put it on the Blanchard . . .

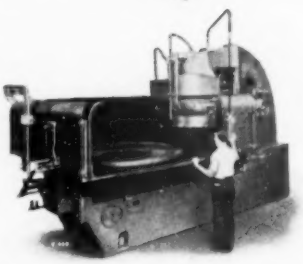
it takes 1/5th the time!

Here is another example of the high production attainable while grinding to extremely close tolerances with Blanchard Surface Grinders and Blanchard Wheels.

It formerly took 45 hours, floor-to-floor, to grind these nine hardened steel machine tool ways. They are 2½" x 3½" x 50" and hardened to Rockwell C-60-63.

Now, these highly desirable results are obtained, using a No. 42-72-84 Blanchard Surface Grinder — nine are placed on the chuck and ground on 6 sides, removing .015" from each surface, parallel to .0001", flat within .0001" with surface finish of 5 micro-inches. The Blanchard **cut time to 9 hours,** floor-to-floor!

No wonder production men say: "Put it on the Blanchard — it takes less time to do a better job".

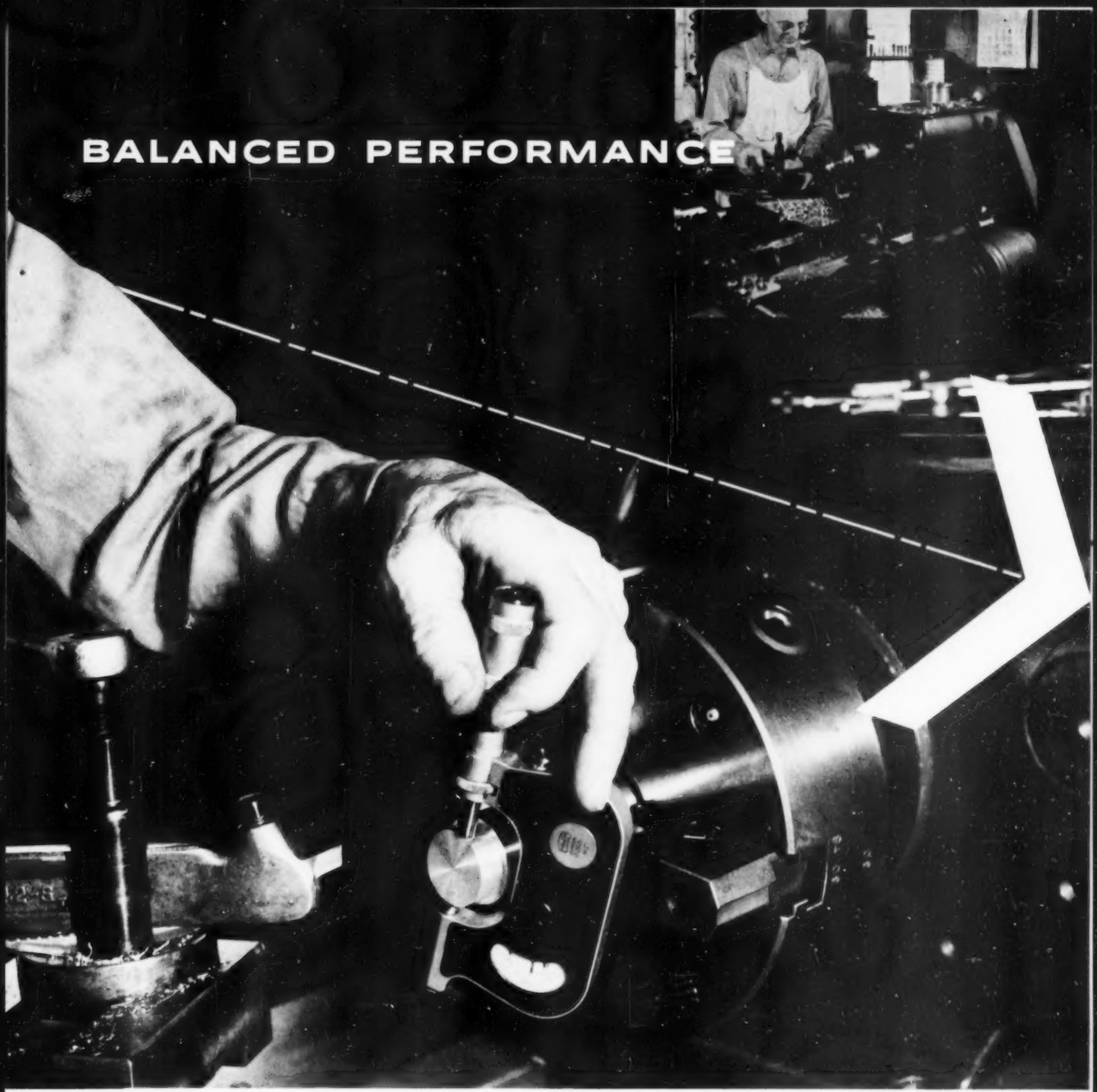


This is the largest Blanchard Surface Grinder, No. 42-72-84.

Send for your free copies of "Work Done on the Blanchard", fourth edition, and "Art of Blanchard Surface Grinding".

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY 64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.



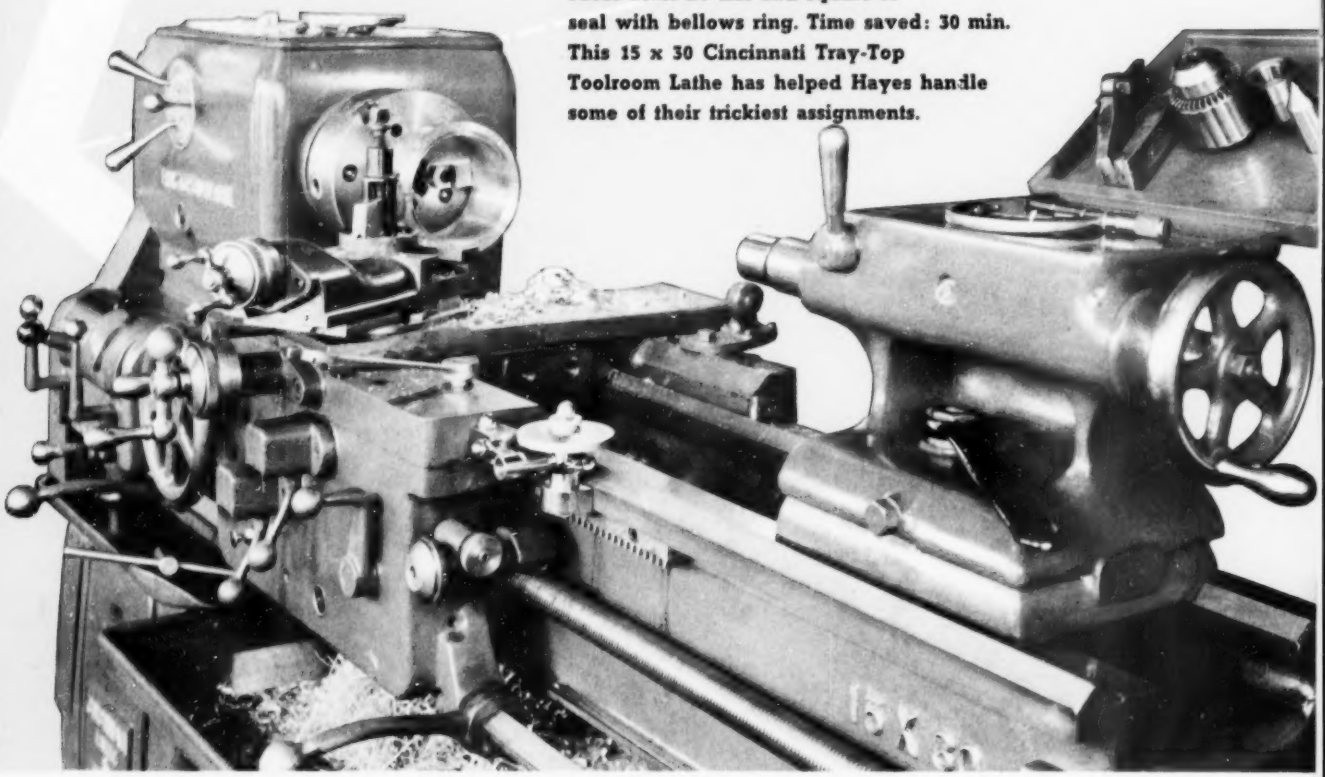
Hayes Scientific Appliances, Urbana, Illinois, often checks work done on their Cincinnati Tray-Top Toolroom Lathe with Zeiss Micrometers, and gets results consistent with inspections with gage blocks on a comparator! This, we think, is dramatic proof that you can do fancy lathe work on Cincinnati Tray-Tops at un-fancy prices. Ask your nearby dealer to show how and why balanced design Cincinnati Tray-Tops deliver important bonuses in precision as well as production.

best buys in their class!

CINTILATHE

CINCINNATI LATHE & TOOL CO., CINCINNATI 9, OHIO, U. S. A.

PRECISION PLUS | AND LOW COST



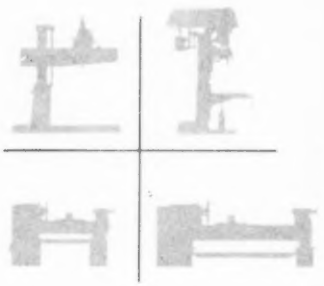
The part: bronze cap for vapor condenser, made by Hayes Scientific Appliances. Tolerances: fit to cylinder within .0003. Faces must be flat and square to seal with bellows ring. Time saved: 30 min. This 15 x 30 Cincinnati Tray-Top Toolroom Lathe has helped Hayes handle some of their trickiest assignments.

CINTILATHES: The complete, balanced line;
Tray-Top for light duty (engine, toolroom and gap bed models);
10", 12½", 15", 18" sizes; 18" to 114" center distances.
Model LT for medium duty (engine and gap bed models).
16", 18", 20", 24" sizes; 30" to 264" center distances.
Write for catalogs and name of your nearest dealer.

best buys in their class!

CINTILATHE

CINCINNATI LATHE & TOOL CO., CINCINNATI 9, OHIO, U. S. A.



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Delpark *Central Filtration*

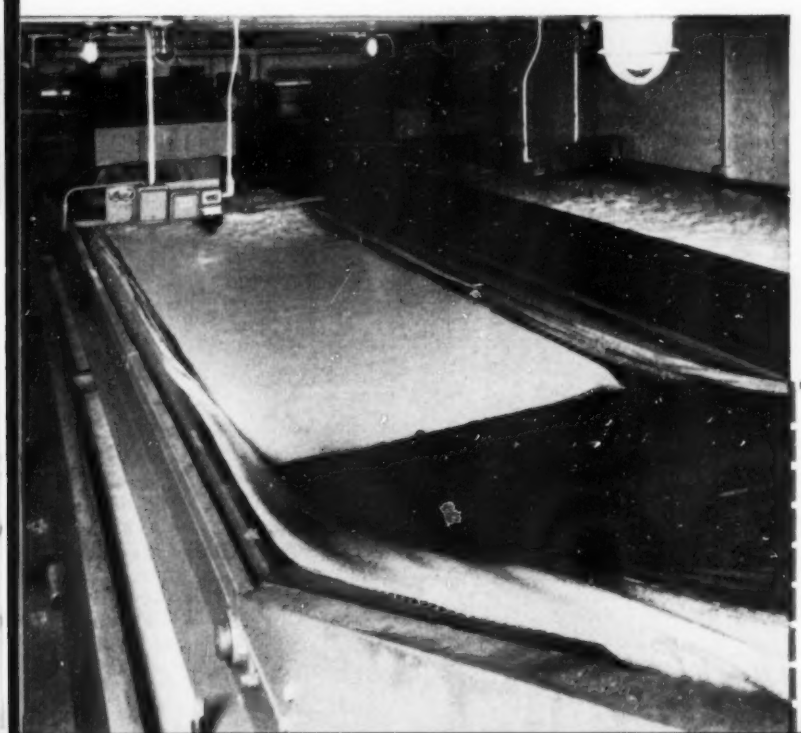
CLEARS THE WAY FOR GREATER SAVINGS AT WARNER & SWASEY

New Philadelphia, Ohio

With plant modernization in mind . . . or new plants in design—if coolant systems are part of the plan, complete the picture with DELPARK *Central Filtration.*

It's here that tremendous savings can be made. For instance, at Warner & Swasey's New Philadelphia Plant, coolant supplied to 24 machines had been in use for seven months without changing—as of the middle of July. The labor savings on coolant changing over this period alone makes interesting figures —but the coolant savings in a 4200 gallon system makes even better figures. The result is: No contamination of coolants. Fewer rejects due to off sizes or attrition. Machines retain their original accuracy longer.

This will mean more to you if the performance is in your plant. Write today for more information on DELPARK *Central Filtration.* DELPARK engineers are ready to assist you with designs for economical and efficient operation.



Two DELPARK *Automatic Filters at below-floor-level station handle coolant flow of 450 gallons per minute each. One maintenance man services these filters on a part-time schedule*

Delpark

INDUSTRIAL FILTRATION

Backed by more than 30 years experience in Industrial Filtration

INDUSTRIAL FILTRATION COMPANY
113 Industrial Avenue, Lebanon, Indiana

Gentlemen: We would like more information on DELPARK *Central Filtration.*

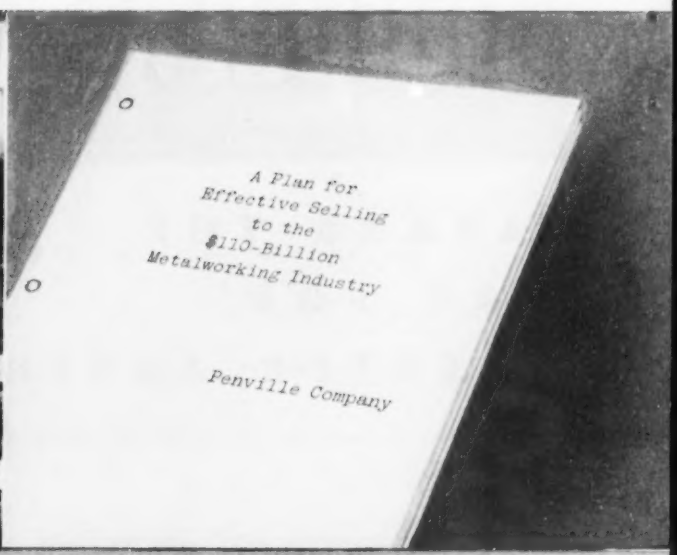
Name..... *Title*.....

Company Name.....

Street Address.....

City..... *State*.....

How to Sell Metalworking's

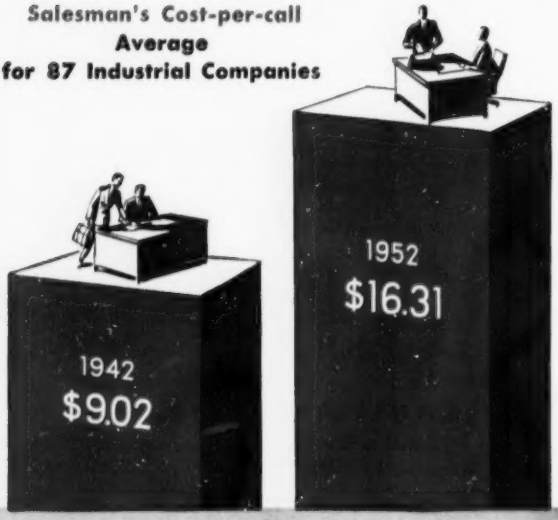


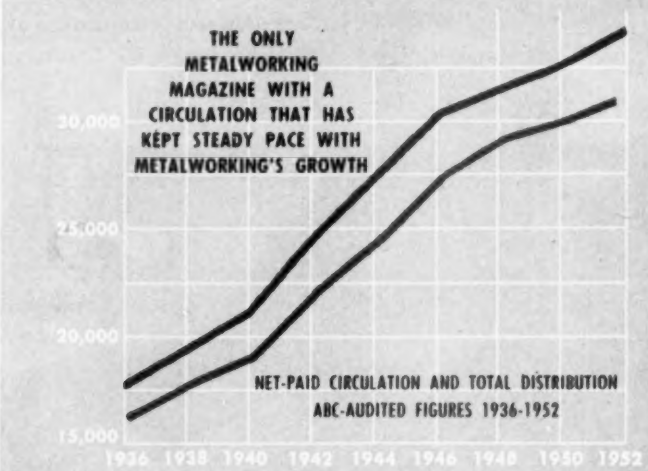
Metalworking production executives use more machinery and equipment, materials, components, and supplies than any other management group in industry. Although we won't know until November how much machinery and equipment is now operating in Metalworking's production shops, the 1950 figure was over three million major units.*

And when you make a comprehensive plan of how you can sell your products to this giant industry most effectively, you must start with the knowledge that the products used by *metalworking production* must be approved by Metalworking's *production executives*. What they use, they *buy*.

*From *American Machinist's* Mid-Century Inventory of Metalworking Production Equipment. A new 1953 Inventory will be one of the outstanding features of *American Machinist's* 1954 PRODUCTION PLANBOOK for Metalworking issue, to be published in Mid-November. Full details about this exciting new editorial service to Metalworking are available from your *American Machinist* representative.

Salesman's Cost-per-call Average for 87 Industrial Companies




THE ONLY METALWORKING MAGAZINE WITH A CIRCULATION THAT HAS KEPT STEADY PACE WITH METALWORKING'S GROWTH
30,000
25,000
20,000
15,000
NET-PAID CIRCULATION AND TOTAL DISTRIBUTION
ABC-AUDITED FIGURES 1936-1952
1936 1938 1940 1942 1944 1946 1948 1950 1952

What's more, the rising costs of personal selling make *American Machinist's* exclusive advertising values more than ever important to you. At the lowest-cost-per-1,000 subscribers of *any* metalworking magazine, *American Machinist* will now ease your salesmen's and distributors' way to the desks of more than 32,000 management-concentrated, production-minded metalworking men (paid subscribers all!)

As a matter of fact, never before have so many metalworking production engineers and executives subscribed to a metalworking magazine as now subscribe to *American Machinist* . . . nor can any other metalworking publication offer you such *continuing* proof of reader acceptance as *American Machinist's* steadily growing paid circulation makes available.

Top 32,000

TO SELL METALWORKING
SELL PRODUCTION MANAGEMENT

VICE PRESIDENT
WORKS MANAGER
CHIEF TOOL ENGINEER
SUPERINTENDENT
METHODS ENGINEER

In 1952 6,894 advertising pages

Quick proof of this fact is available to you in the advertising judgment of over 800 companies which also sell their products to Metalworking. Knowing that they must sell production management, they concentrate their advertising in the magazine that is edited *exclusively* for Metalworking's production executives . . .

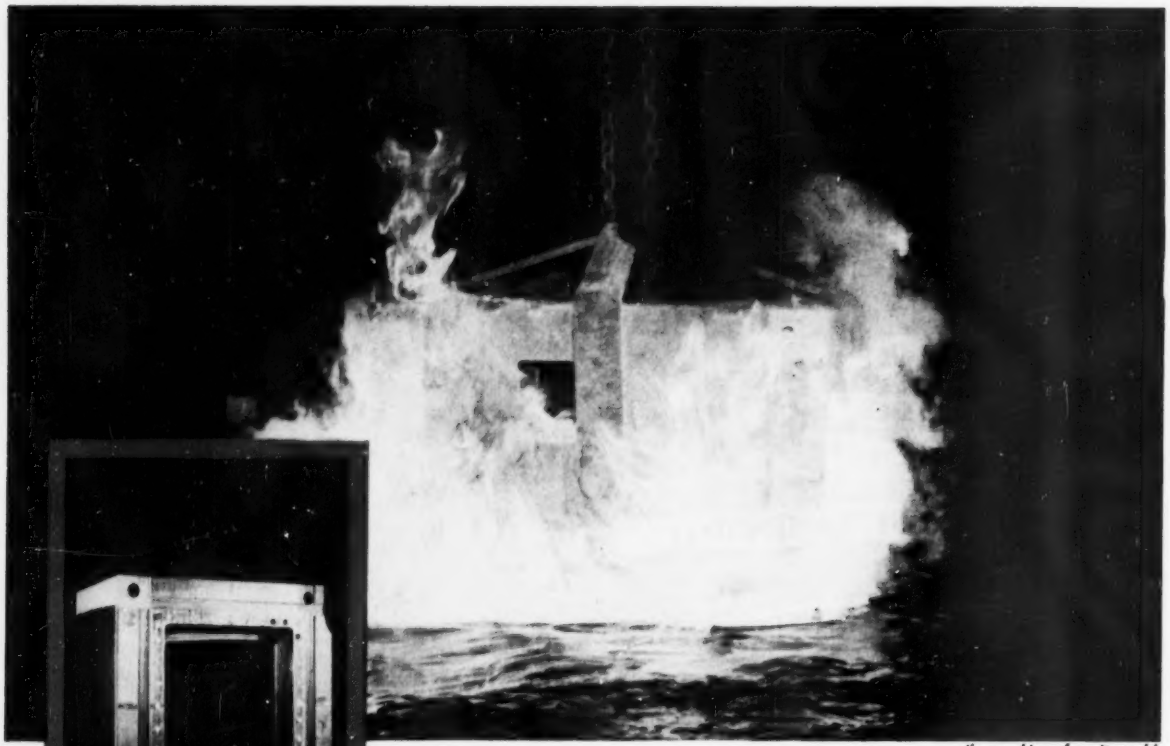
. . . and each year place more advertising for metalworking production machinery and equipment, materials, components, and supplies in *American Machinist* than is carried by any other publication.

SO . . . when *you* want increased sales in the $110-billion Metalworking Industry, and want to build preference for your products among this industry's most important buying group . . . production management . . . the facts will tell you why:

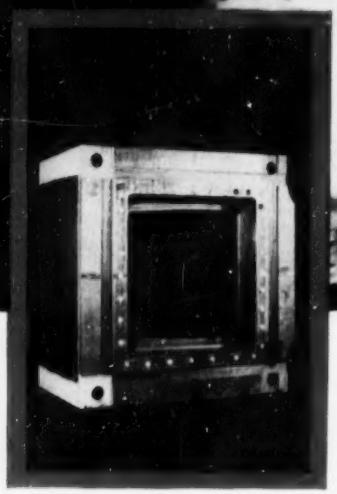
This is the No. 1 place to do business with America's biggest industry

The McGraw-Hill Magazine of Metalworking Production
McGraw-Hill Building, New York 36
Published Every Other Monday
Member of the Audit Bureau of Circulations and Associated Business Publications

ABP ABC



..oil quenching of cavity mold



LINDBERG STEEL TREATING HELPS MAKE BETTER TELEVISION CABINETS

Plants in

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Fireside 6200

LOS ANGELES
2910 So. Sunol Drive
ANgelus 9-7311

On Chicago's west side, one of the largest sets of plastic molds in the world is producing 21" Motorola television cabinets at a rate of more than one every five minutes.

These molds, designed by Chicago Molded Products Company in cooperation with Motorola, and heat treated by Lindberg Steel Treating Company, weigh more than five tons . . outside dimensions are 40" x 43" x 36" . . and they're worth $75,000 a pair!

The production of such a set of molds is a perfect example of team-work by American industry. Crucible Steel Company poured the ingots, and pressed them into huge blocks each weighing 13,900 pounds. The R. O. Schulz plant in Elmwood Park, Illinois, did the machining and polishing.

Next, came the heat treating . . the finished molds had to be treated to precisely the right hardness . . for they had to withstand the washing of plastic materials . . and they had to be tough enough to stand up under the terrific pressure of the 1500 ton compression molding press.

At this point Lindberg metallurgists and heat treaters went into action. There could be no trial runs . . no mistakes, or $75,000 worth of molds quickly could become $600 worth of scrap metal.

Heat treating specialists selected the proper furnace, specified the correct heating temperature, the necessary time at heat, the right procedure for quenching. "Operation Motorola" went off without the slightest hitch. Within hours after tempering, the molds received final surface polishing . . in a matter of days they were forming cabinets for Motorola TV sets.

Lindberg Steel Treating Co., and its large staff of metallurgists and heat treaters are available to consult on *your* heat treating requirements . . whether your problem is simple or "almost impossible."

A case history of Lindberg Steel Treating Co. service to American industry

LINDBERG STEEL TREATING CO.

1983 North Ruby Street, Melrose Park (Chicago), Illinois Phone: MOnroe 6-3308

High Precision, Reliability, Top Performance

SCHAERER

MODEL UN-450

Heavy Duty Lathe

SCHAERER MODEL UN-450 HEAVY DUTY COPYING LATHES.

Twin cross slides. Copies from cylindrical or flat template either longitudinally or cross. Twin slides permits rough turning and finish turning in the same operation in many instances. Swings 17-3/4" over bed, 9" over carriage,, 20-5/64" over gap. Center distance 60". Spindle speeds 31.5 to 1400 R.P.M. Hydraulic copying attachment can be removed to permit use as a regular twin slide lathe when necessary. 10 H.P. motor drive to spindle. Separate motors for coolant and hydraulic pump. A production lathe built to tool room standards.

OUTSTANDING FEATURES

Copies simultaneously in 2 directions; 49 longitudinal and cross feeds; All gears in headstock hardened and ground; Automatic carriage release when overloaded; Separate oiling systems for front and rear end bearings; Ball stop catch on cross slide guarantees accurate depth adjustment for thread cutting; Adjustable carriage stop for longitudinal turning.

- *Guaranteed Service by Trained Staff*
- *Engineering Staff will make recommendations based on your requirements*
- *Spare Parts in Stock*
- *Your Operators Trained*
- *Early Deliveries—Some from Stock*
- *Competitive Prices*
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Many More Machines for Every Operation

Write for free illustrated brochure 100, or state your specific requirements.

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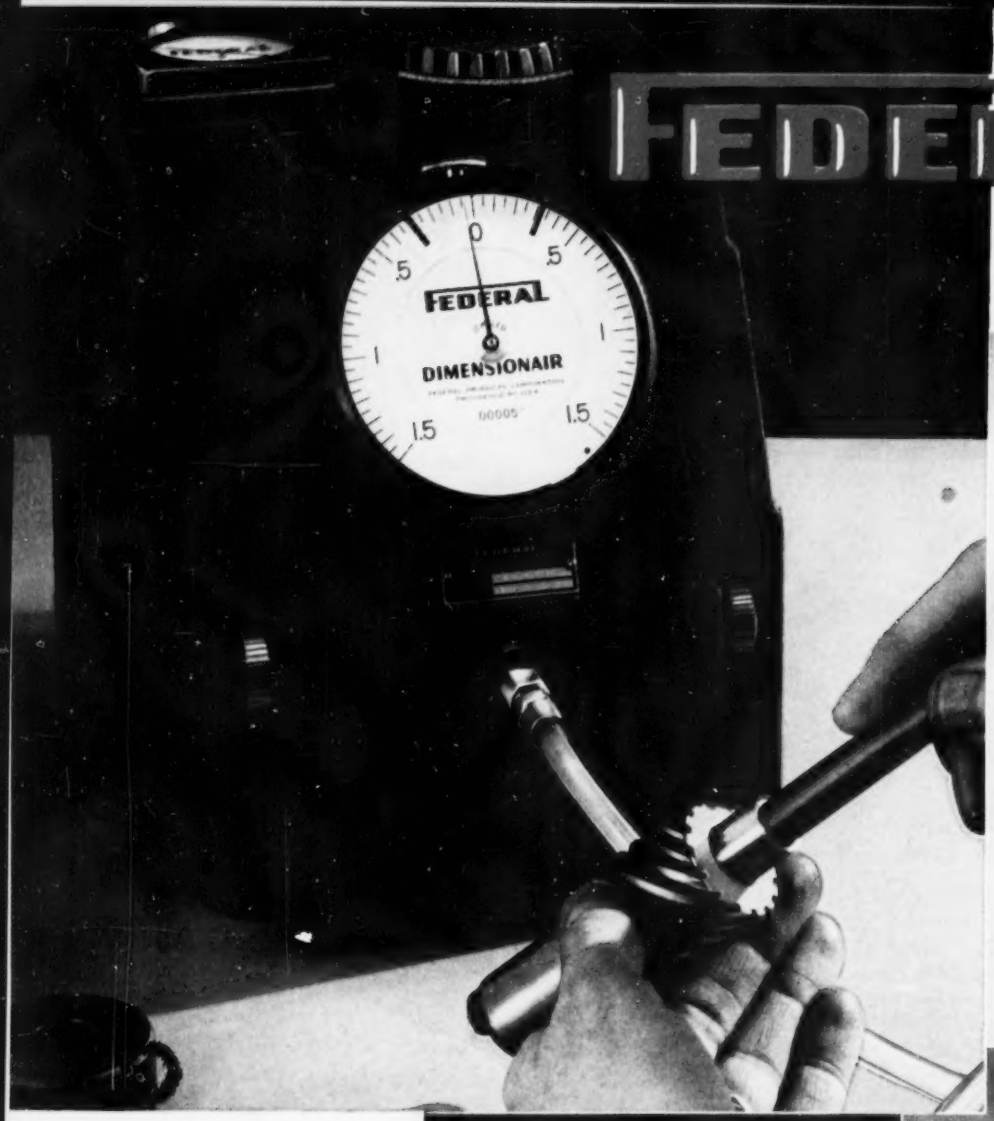
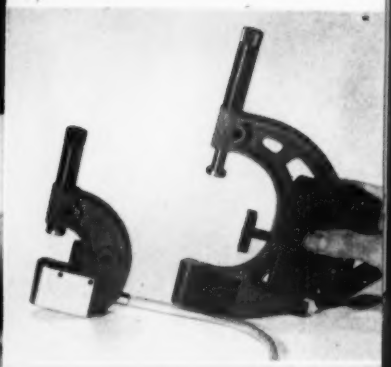
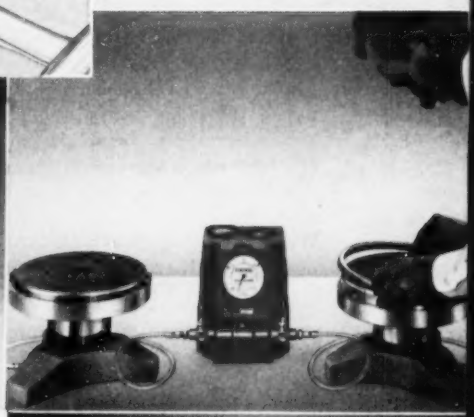
FEDERAL







AIR and ELECTRONIC

The hole is measured by air and the measurement is classified by the electronic circuit into one of 18 categories. The gage then *automatically* stamps the size on each workpiece for future identification.

(*Above*) Explores inside diameter for taper, out-of-round and bellmouth, etc., over total length of workpiece. Dial Indicator checks distance from bottom of bore to outside shoulder.

(*Above, right*) These two six-jet air plugs gage thin-walled workpieces for average diameter. Especially applicable to work which may be distorted when fitted to its component.

Single jet air plug inspects accuracy of location of three holes in workpiece in relation to the two large locating spindles on the master fixture. An excellent gage for gear box, meter and pump housings.

DIMENSIONAIR

has *Everything* YOU NEED in an AIR GAGE

AIR SNAPS

Air Snaps are adjustable for size and made to cover all dimensions. Measuring contact is mechanical — not a jet.

THE DIMENSIONAIR IS REALLY AN OUTSTANDING AIR GAGE. Not only is it unique in its basic repetitive measuring accuracy, stability and longer range per magnification, but it is set to zero in a second and requires a minimum of maintenance. Changing plug sizes is much quicker. Resetting zero is a matter of seconds . . . no fiddling around.

Now Dimensionair, combined with electronics, is used for automatic sorting gages (See lower left illustration).

Because only a Single Master is needed with the Dimensionair, the cost of *two* masters, as required by other air gages, is cut in half. Gage at lower right required only 25 masters, instead of 50, to cover all size requirements. That's a worthwhile saving in any shop.

The graduated scale is accurately calibrated. It is not a scale arbitrarily divided between plus and minus tolerances. The magnification is fixed.

Three-jet air plug enables accurate inspection of out-of-round holes.

The gage plug has greater clearance and greater wear. The former makes it much easier to enter the plug in the hole. The plug wears much longer because the jets are set deeper; the greater range makes this possible.

Owners tell us there is no comparison after they have used various types of air gages. You really owe it to your plant to use the Dimensionair.

Federal Products Corporation, 1210 **Eddy St., Providence 1, R. I.**

ASK FOR OUR NEW AIR GAGE CATALOG

A Dual Dimensionair gages the inner and outer faces of ball bearing raceways *indirectly by mechanical contact.*

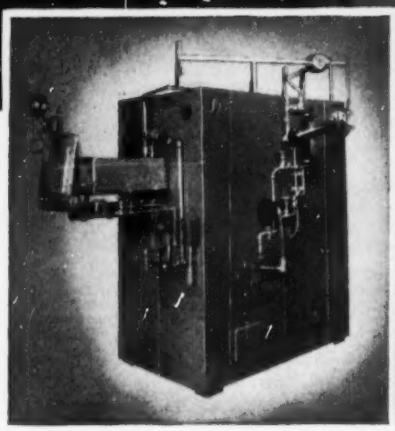
Adjustable Air Gage for fast simultaneous inspection of Ball Bearing ID & OD over a large range of 25 different sizes up to 10 inches. Checks taper, bellmouth and out-of-round. Used for *incoming inspection.* Cost of masters was cut in half because Dimensionair requires only *one* master for each size.

This new, complete catalog is full of helpful information—shows advantages and application possibilities of the modern Air Gage. Learn all about the latest in air gaging . . . ask for your copy today. Write Federal Products Corp., 1210 Eddy St., Providence 1, R. I.

FEDERAL

Largest manufacturer devoted exclusively to designing and manufacturing *all types* of DIMENSIONAL INDICATING GAGES

FOR YOUR TOOLROOM—Type H are designed for applications where batch heat-treating is possible and where a protective atmosphere is not required. They have a temperature range from 1200° to 1850° F. Safe loading capacity at 1600° F is 180 lbs./sq. ft. of hearth area.



FOR YOUR LABORATORY—High-temperature muffle furnace, for operation at 3000° F. This precision furnace was designed specifically for use in modern laboratory operations requiring extremely high controlled temperatures.

FOR YOUR PRODUCTION LINE—Type HG are primarily designed for hardening of carbon and alloy steels without scale or decarb when used with Endogas® atmospheres. Exogas® may be used to minimize scaling.

Westinghouse combines versatility and low cost in toolroom heat-treating

If your toolroom heat-treating calls for hardening, annealing, normalizing or pack carburizing, a Westinghouse Box-Type Furnace will fill your requirements. The Type H unit, for example, may be used without a protective atmosphere. Type H is built in five sizes to cover a broad scope of toolroom or production heat-treating requirements. And all sizes of these furnaces are designed for automatic temperature control.

Whether it be for your toolroom, laboratory, or production line, you'll get the heat-treating flexibility you need and want at low cost with Westinghouse Box-Type Furnaces.

For more information regarding Westinghouse Heat-Treating Furnaces, phone your nearest Westinghouse office, or write to Westinghouse Electric Corporation, Industrial Heating Department, Meadville, Pennsylvania. J-10393

YOU CAN BE SURE...IF IT'S

Westinghouse

Westinghouse Electric Corporation
Industrial Heating Department
Meadville, Pennsylvania

Please send me free 40-page booklet, *Harnessing Heat.*

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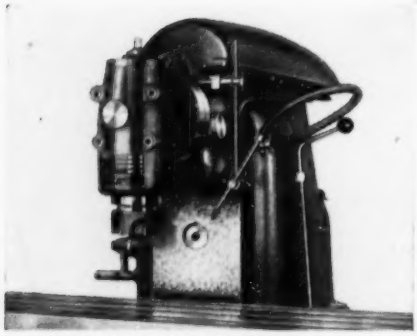
City_____ Zone_____ State_____

Swedish Craftsmanship!



Sajo Vertical Milling Attachment

The Sajo "Plain" Milling Machine

the SAJO "UNIVERSAL" MILLING MACHINE

exemplifies the expert workmanship that is traditional in Swedish machine tools. Like all SAJO Millers, this new Universal Milling Machine was designed and built to the highest standards of quality and practical utility.

Avoidance of exterior "luxury" features, slight in value but substantial in cost, and concentration on the vital factors of construction, enable the SAJO to deliver top performance at moderate cost.

SAJO Millers are available in Plain and Universal types, with longitudinal power table feed only, or with power feed in all directions. Screws and dials are in the U. S. inch system.

★ **Standard Equipment includes:**
3 HP motor and starter equipment, motor driven coolant system, adjustable table feed nut to allow climb-milling, 1" arbor, arbor support brace.

★ **Extra Equipment:**
Universal Dividing Head, Vertical Milling Attachment, Slotting Attachment, Swivel Base Vise, Rotary Table.

CONDENSED SPECIFICATIONS

Table Size	41½" x 9¼"
Longitudinal travel: Plain Miller	24½"
Universal Miller	27½"
Transverse travel	8¼"
Vertical travel	19"
12 spindle speeds	36-1540 RPM
Table feeds	12
Taper in spindle	No. 40 NMT
Main motor	3 HP

Precision anti-friction bearings on spindle and gear shafts
One-piece column and base
Net weight—2200 lbs.

Write for Catalog

NO PRIORITY—— PROMPT DELIVERY——ATTRACTIVE PRICE

AUSTIN INDUSTRIAL CORP. 76-F MAMARONECK AVE. WHITE PLAINS, N. Y.
DEALERS IN PRINCIPAL CITIES

CLEEREMAN DRILLING MACHINES

LOWEST Operating Costs!

Why?

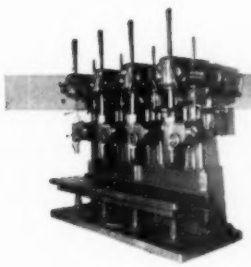
1—Eliminate Down Time.

2—More Power to Produce.

3—Lowest Maintenance Costs.

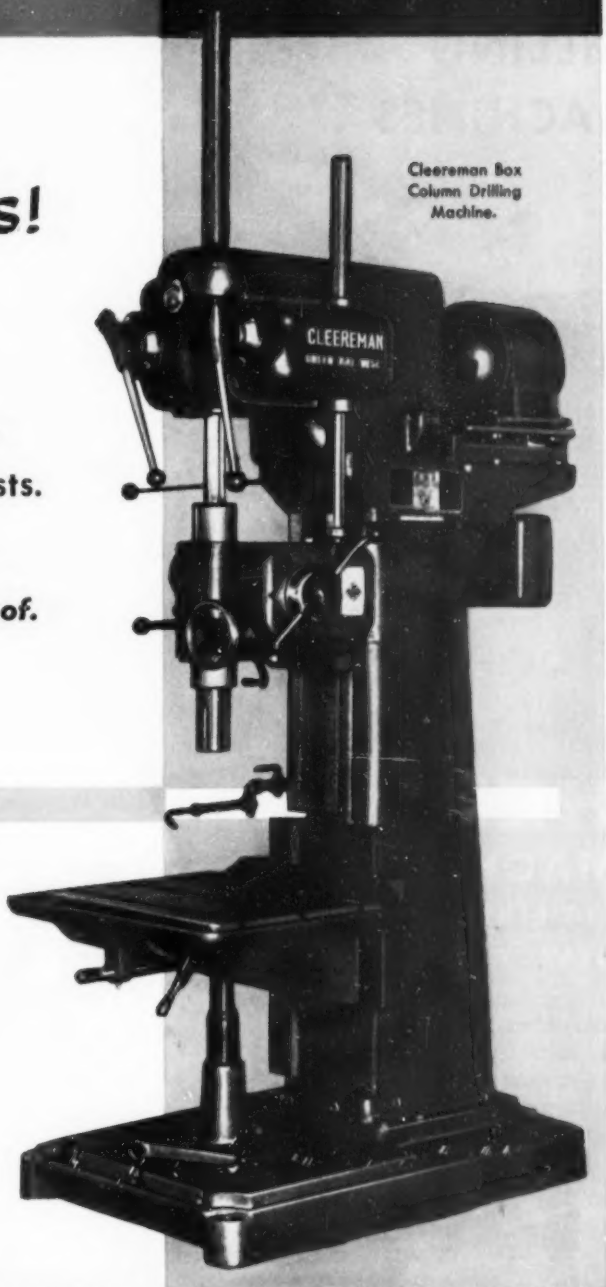
4—Less Operator Fatigue.

Go to any Cleereman user for proof.



Cleereman Multiple Drilling Machine.

Cleereman Round Column Drilling Machine.



Cleereman Box Column Drilling Machine.

BRYANT Machinery & Engineering Company

General Office
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Representatives in Principal Cities

CLEEREMAN MACHINE TOOL CO. Green Bay, Wisconsin

BUILDERS OF PRECISION JIG BORERS AND DRILLING MACHINES

Cut Costs and
Increase Efficiency with

HELLER

LONG BED MILLING MACHINES

HELLER
MACHINE CO.
114 LIBERTY STREET,
NEW YORK 6, N. Y.

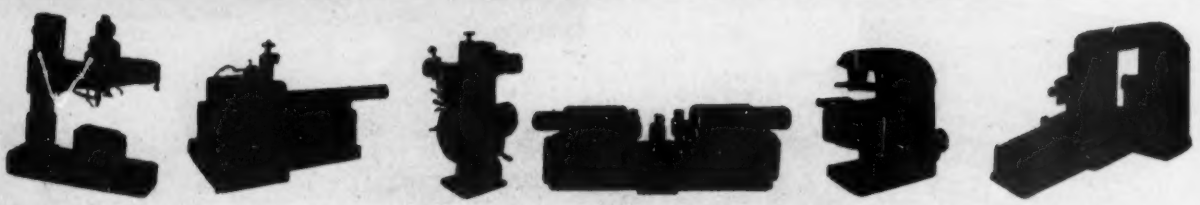
KNEE & PLANER TYPE MILLING MACHINES
COLD SAWING MACHINES • SAW SHARPENING MACHINES • SAW BLADES • TRANSFER MACHINES • SPECIAL MACHINES

Builders of medium and heavy Long Bed Milling Machines with independently controlled milling carriages through electro-hydraulic operation.

Illustration shows machine specially designed for milling rotor slots and for work on heavy frames, bonnets, and large miscellaneous types of castings.

Available in smaller machines from 15 HP rated carriages up to 400 HP milling carriages.

Importing Heller Machines Since 1926



DRILLING MACHINES | COLD SAWING MACHINES | SAW SHARPENING MACHINES | TRANSFER AND SPECIAL MACHINES | KNEE TYPE MILLING MACHINES | PLANER TYPE MILLING MACHINES

...with TYCOL lubricants on hand!

A Cutting Oil with a "Delicate" Touch! Screw threading to fine tolerances is the acid test of any cutting oil . . . one reason why we ask: can your present oil measure up to Tycol Angrove 40? Take the customer who was threading ⅜" standard threads on 303 Stainless . . . with thread extending to the head . . . and the overall job calling for an extremely fine finish. The best of the competitive oils used yielded only 600 pieces before serration and burring appeared, necessitating regrinding the chaser. Tycol Angrove 40 produced some 4,500 pieces with no defects apparent under magnification . . . and with no regrinding of the chaser throughout the entire run! If you can't top this – contact your local Tide Water Associated office for further information!

Over 300 Tycol industrial lubricants are at your disposal . . . engineered to fit the job!

REFINERS AND MARKETERS OF VEEDOL . . . THE WORLD'S MOST FAMOUS MOTOR OIL

TYCOL
INDUSTRIAL LUBRICANTS

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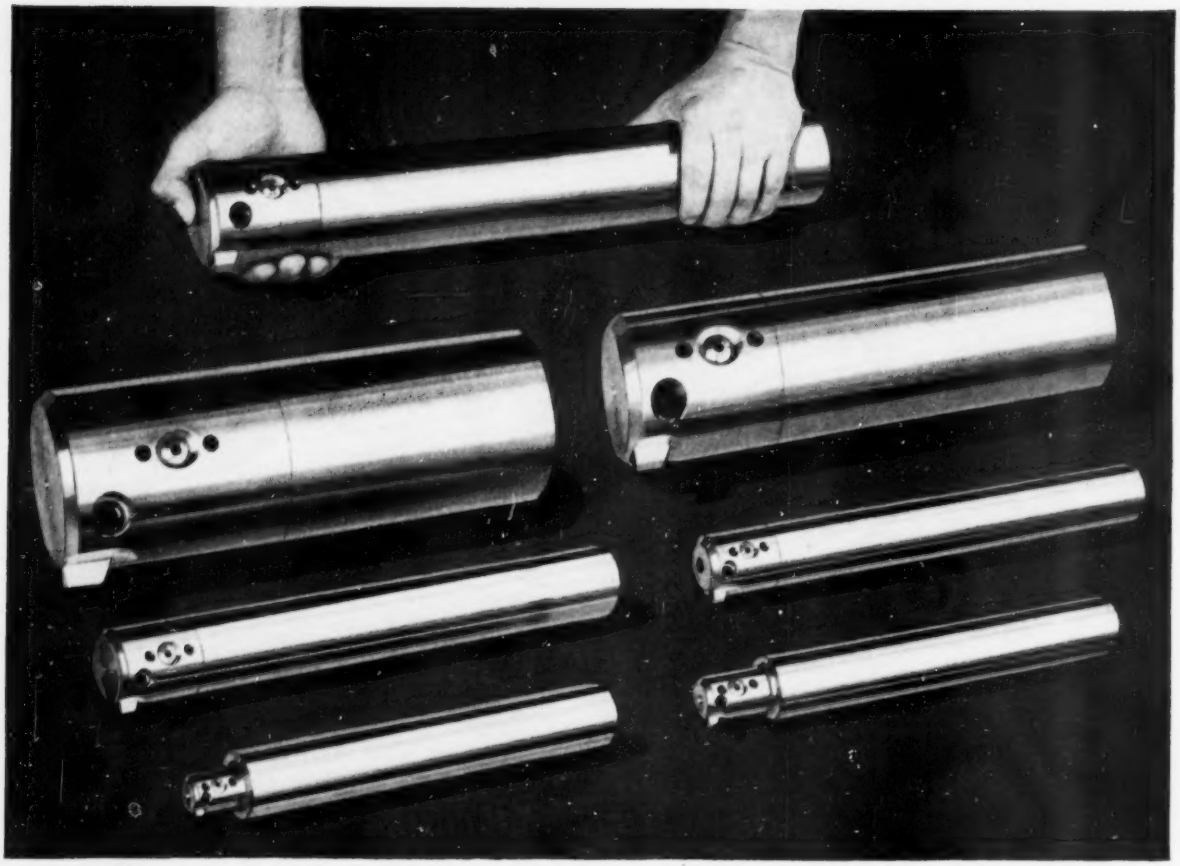
Philadelphia • Chicago • Detroit
Tulsa • Cleveland • San Francisco
Toronto, Canada

TIDE WATER ASSOCIATED OIL COMPANY
11 BATTERY PLACE - NEW YORK 4, N. Y.



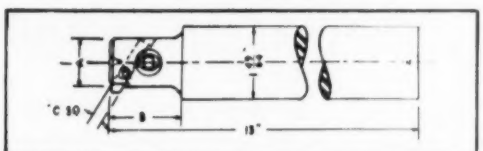
Why wait for delivery on precision boring tools?

Get immediate delivery of Davis stub boring tools with unfinished shanks and finish them in your own shop

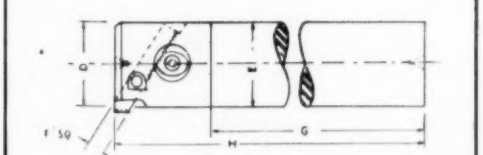
It's fast. It's inexpensive. It's practical. In a matter of hours your order is shipped from stock. Without costly delays, you have high precision boring tools for any job requiring 1¼ to 7 in. bore diameter.

Properly centered and prepared for turning, these Davis tools are designed for use with high speed steel, super high speed steel, or tungsten carbide tipped cutters. They are the same high quality tools — heat-treated 4150 alloy steel Rockwell "C" 28.32—as Davis finished shank tools.

Get in touch with your Davis representative or write for Bulletin DB-110 for complete information.



Tool No.	A	B	C	Boring Range
123	1"	1½"	¼"	1¼" To 1½" Dia.
121	1¼"	2"	5/16"	1½" To 2" Dia.



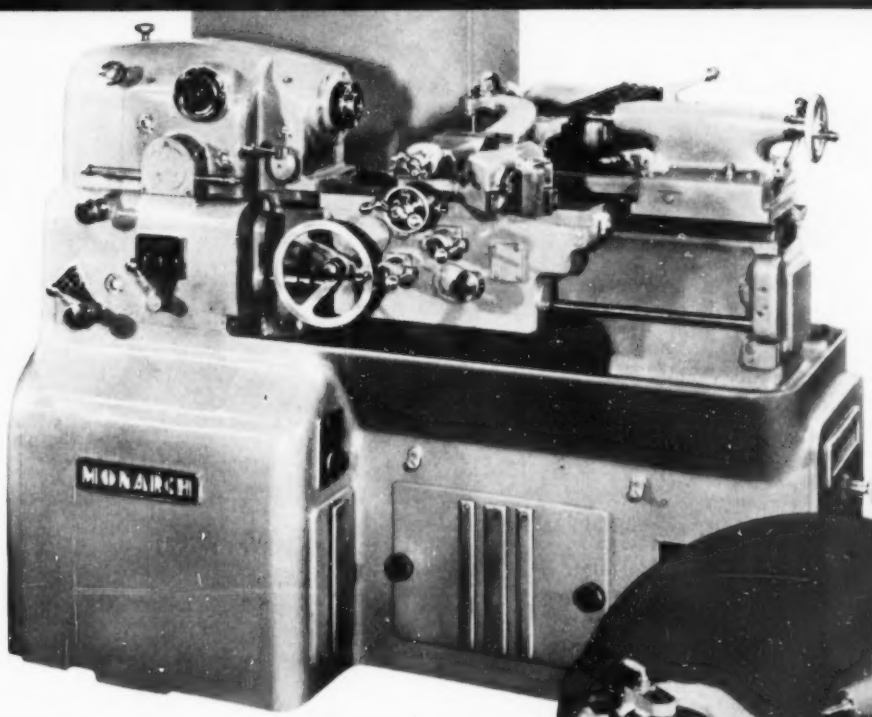
Tool No.	D	E	F	G	H	Boring Range
118	1¾"		⅜"	12¼"	14¼"	2" To 2⅝" Dia.
116	2¼"	"D"	½"	14½"	17"	2⅝" To 3¼" Dia.
114	2¾"	Plus	⅝"	16"	19"	3⅛" To 4⅛" Dia.
111	3½"	1/64"	¾"	8½"	12"	4⅛" To 5¼" Dia.
107	4½"		1"	7"	12½"	5¼" To 7" Dia.

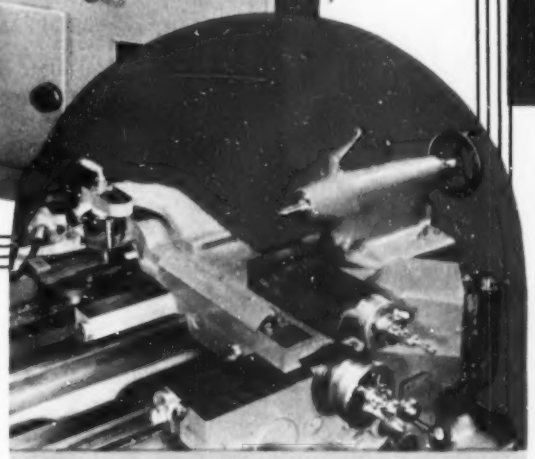
If Davis can't bore it — it can't be done

DAVIS BORING TOOL DIVISION
GIDDINGS & LEWIS MACHINE TOOL COMPANY
FOND DU LAC, WISCONSIN

Builders of plain and micrometer adjustable block type boring tools; line boring bars; special boring tools; car boring tools; planer, vertical boring and turning mill tools; Quick Change arbors and sleeves.

Can you spot the brand new touch in this Production Masterpiece?





MONARCH TYPE C RIGID AIR-GAGE TRACER DETAIL

Note that the tool, mounted not on the hydraulic slide but on its own slide, can be adjusted for diameter changes without altering template or tracer setup.

The close-up view of the cross-slide tells the story! ☛

We've *improved* on the performance of our famous 10″ Model EE Precision Lathes (some users swore it couldn't be done!)—by making them available with our Type C Rigid Air-Gage Tracer.

This more compact, more rigid design not only permits an ever higher quality standard, but increases the range by allowing a generous 3″ maximum diameter change at a single setting. Conversion can be made within seconds to manual control for the usual turning, boring and facing operations.

The Air-Gage Tracer is widely acknowledged as the most accurate duplicating device yet developed—and can be applied to either the 10″ Model EE Sensitive Precision Toolmaker's Lathe or to the 10″ Model EE Precision Manufacturing Lathe (above). Both of these lathes, with over 6000 in use, have fully earned their designations. To this combination, add such refinements as the vibration-dampening Monarch Electronic Drive—and you get a turning instrument unequalled for precision, speed and sensitivity. Write now for our new Booklet No. 2607, featuring many job reports . . . *The Monarch Machine Tool Company, Sidney, Ohio.*

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ACCURACY • ECONOMY • LONG LIFE

TURNING MACHINES

FOR A GOOD TURN FASTER . . . TURN TO MONARCH

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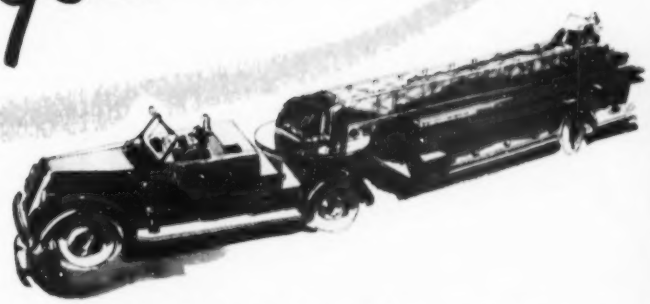
he gives you "Fire Engine Speed" in delivering your orders



"Bachelor of Saws" specially educated in cutting tool applications

Always Ready to "Hunt Down" New Ideas

Business Services that save your time and money

He comes on the jump . . . any time of the day or night . . . when the alarm sounds from your plant for quick delivery of Simonds Saws, Machine Knives or Files. So you don't have to sit by and watch valuable production time go up in smoke for want of replacement cutting tools.

This is one of the vital services which *your* Simonds Industrial Supply Distributor is always ready to offer *you* . . . quick delivery that saves you time . . . ample stocks that are always available . . . simplified paperwork (one order, one bill, one payment) . . . hunting down new product developments . . . help in solving engineering problems. And he knows the practical application of Simonds Cutting Tools . . . the tools that are 100% quality-controlled, from steel to finish-grinding. So call the nearest Simonds Distributor at any time. He'll come at the drop of a hat . . . *any hat you want him to wear!*

SIMONDS
SAW AND STEEL CO.

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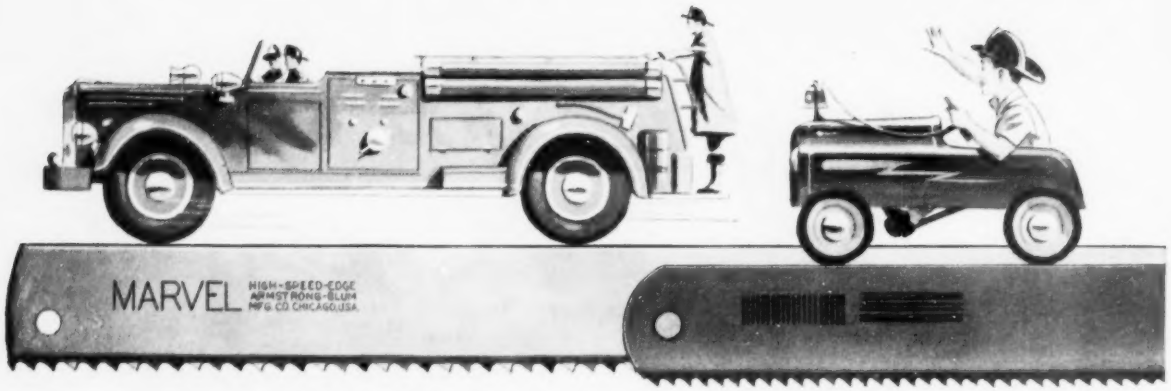
Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon.
Canadian Factory in Montreal, Que.
Simonds Divisions: Simonds Steel Mill, Lockport, N. Y.
Simonds Abrasive Co., Phila., Pa. and Arvida, Que., Canada



. . . *but*
Experience Cannot be Copied

More than a quarter-century ago MARVEL invented and basically patented the MARVEL High-Speed-Edge Hack Saw Blade—the UNBREAKABLE blade that increased hack sawing efficiency many-fold.

Every MARVEL Hack Saw Blade ever sold has been of that basic welded high-speed-edge construction, with constant improvements from year to year, as EXPERIENCE augmented the "know-how" . . .

MARVEL is not "tied" to any single source of steel supply, and has always used the best high speed steels that became available from time to time as metallurgy progressed. When-as-and-if finer steels are developed—and are proven commercially practical for welded-edge hack saw blades—MARVEL will use them, regardless of cost or source . . .

There is only one genuine MARVEL High-Speed-Edge! All other "composite" or "welded-edge" hack saw blades are merely flattering attempts to imitate — without the "know-how" of MARVEL EXPERIENCE . . .

Insist upon *genuine* MARVEL High-Speed-Edge when buying hack saw blades—and be SAFE, for you can depend upon MARVEL. They have been "tested", "pre-tested", and "re-tested" by thousands of users for more than a quarter-century!

MARVEL *Metal Cutting* SAWS
Better Machines-Better Blades

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Specialized factory service available everywhere.

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IN THE WALKER BULLDOG TANK

special U·S·S Carilloy steel reduces the cost of critical transmission parts

● How would you like to save $25 a ton on steel for your heavy-duty parts, without sacrificing quality? We bet you'd jump at the chance, just as the manufacturer of the Army's great Walker Bulldog Tank did.

U·S·S Metallurgists showed him how to make this important saving. They recommended special U·S·S-developed Superkore steel for the drive gears and pinions of this powerful machine. This steel provides the required hardenability, but contains less alloy than other steels capable of doing the job. Therefore, it costs less.

U·S·S Superkore also responds more uniformly to heat treatment and is easier to machine than ordinary alloy steels of equal hardenability.

U·S·S Superkore—now known as TS 43BV12 and adopted in both AMS and ASTM specs—is one example of the many important new developments that have come from the extensive research laboratories of United States Steel. From our constant effort to get the *most possible work* out of steel, at the *lowest cost* to you, have come better steels for use at high temperatures—better steels for use at extremely low temperatures—steels that are easier to machine—steels that are easier to heat treat—steels that in hundreds of ways help to solve production problems and reduce costs.

We may have ready for use or under development just the steel you need to solve a tough production problem. If we do, the U·S·S Service Metallurgist who contacts you will know about it. If we don't, we may be able to modify an existing U·S·S CARILLOY steel to suit your special requirements. In either event, it will pay to get in touch with us and find out.

If you have any question at all about alloy steels, write to United States Steel, Room 2818-Y, 525 William Penn Place, Pittsburgh 30, Pa.

UNITED STATES STEEL CORPORATION, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
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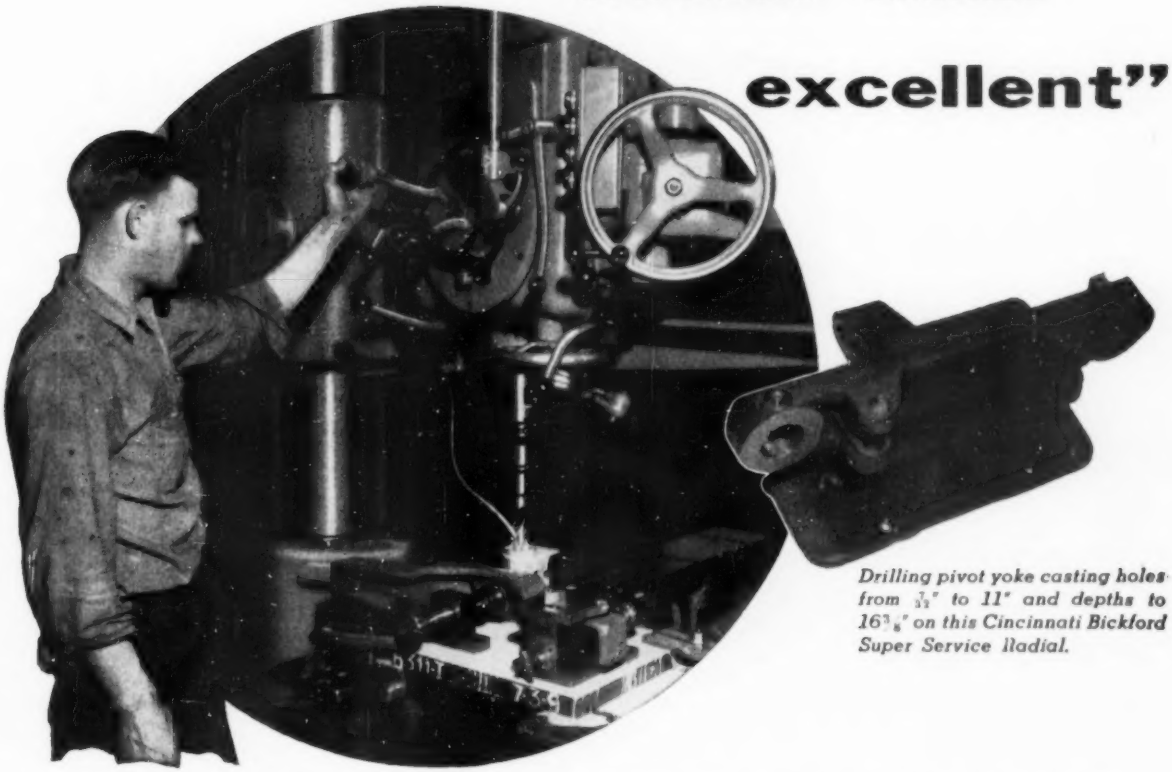
"better than excellent"



Drilling pivot yoke casting holes from $\frac{3}{4}$" to 11" and depths to 16$\frac{3}{8}$" on this Cincinnati Bickford Super Service Radial.

A prominent truck manufacturer has increased shop capacity in heavy drilling with this Cincinnati Bickford Super Service Radial Drill. They say "Better than excellent performance and for ease of handling, the best in this size machine".

The illustration shows the convenient grouping of controls which makes for easy, fast handling. Note the operator's unobstructed vision of the work, even with the head in a low position. These features can increase your output.

Write for Booklet R-29 on these highly productive and accurate Cincinnati Bickford Super Service Radial Drills.

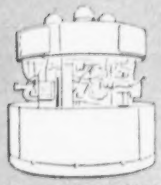
CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

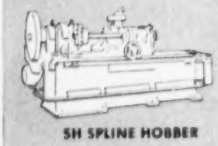
THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio, U.S.A.

12-S HOBBER



7-A ROTARY HOBBERS

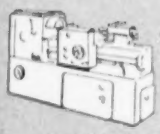


SH SPLINE HOBBER

MODEL 40 THREAD MILLER

HT THREAD MILLER

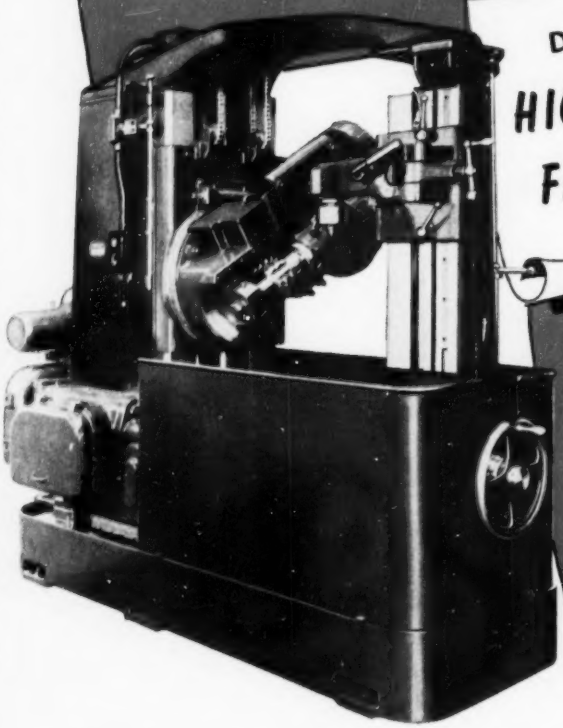
CRI-DAN "D"



CRI-DAN "B"

The Lees-Bradner Model "R" HEAVY-WEIGHT HOBBER

DESIGNED FOR
HIGHER SPEED
FASTER FEED



SPECIFICATIONS

Maximum Outside Dia.	16" / 18"
Travel Maximum Helix	RH 45° – LH 60°
Machine Weight	13,000 lbs.
Motor Requirements	15 to 25 HP

The true measure of the value of a machine tool is its productivity. And top day-in and day-out productivity can *only* be maintained if "down time" for maintenance is cut to a minimum.

The Lees-Bradner Model "R" hobbing machine was designed and built to perform at higher speeds with faster feeds and at longer intervals of time than any other machine of its type. It has a rated capacity far in excess of that required by the work that will normally be run on it. This additional "built in" capacity guarantees an extra margin of performance on long production runs.

So, if you have a hobbing operation where high, uninterrupted production is a "must", by all means investigate the Lees-Bradner Model "R" hobber. Call in our representative in your area or get in touch with us direct.

the LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.

precision meets production

When precision meets production . . . the result is profits! That conclusion has been proved again and again by Lodge & Shipley Lathes.

Each type of Lodge & Shipley Lathe has many special advantages, some of them exclusive developments. They all have a common purpose, more production, greater accuracy and lower cost. They all have set notable records in American and foreign industry.

Even if your present lathes were "the last word" only a few years ago, you should investigate Lodge & Shipley's contribution to "more production through modernization."

A Lodge & Shipley representative will gladly survey your work. He'll show you, with comprehensive case histories, how Lodge & Shipley Lathes are setting production records on comparable work.

THE LODGE & SHIPLEY CO.
3055 Colerain Avenue, Cincinnati 25, Ohio

Lodge & Shipley

....your **LODGE**-*ical choice!*

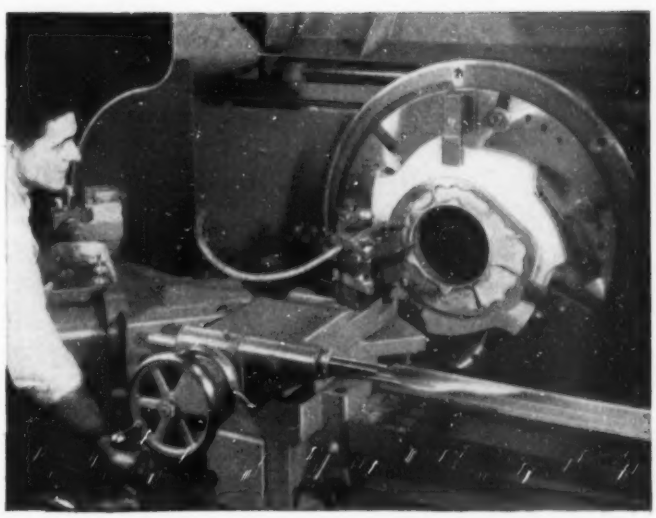
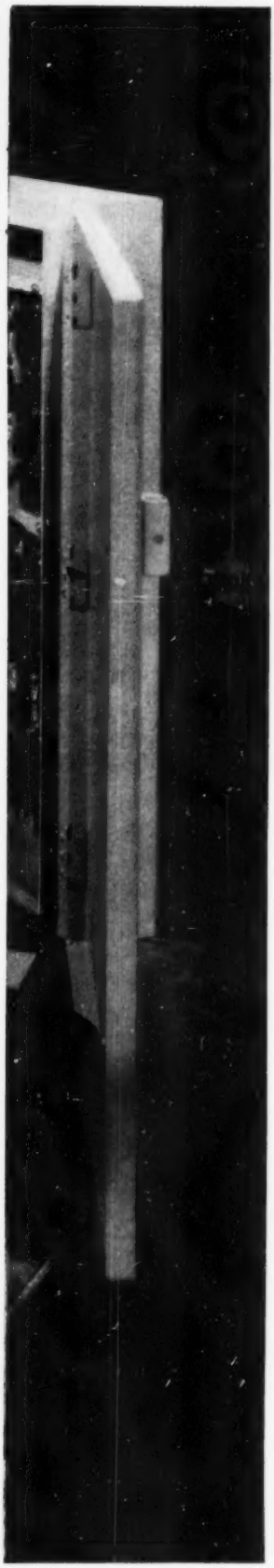


Illustration shows the Lodge & Shipley T Lathe machining thin wall, large diameter workpiece at Hotpoint Co.*

*T/M The Lodge & Shipley Co.



Build the best control panels your machines ever had

Match the proved protection of Westinghouse AB Circuit Breakers with the rugged dependability of Westinghouse Motor Control

For control panels that work harder, longer, more accurately and with less attention, look to Westinghouse. It can be your complete supplier of control components.

Westinghouse AB Circuit Breakers have been for years the world's standard in circuit protection. They are ideal for the hard service of machine control panels. Rugged, compact, completely dependable, they require no maintenance—save mounting space.

Westinghouse Motor Control is the new standard of control performance. Two of the many exclusive design features of Westinghouse Life-Line Starters assure maximum dependability over millions of operations:

1. Knife-edge bearing of specially hardened steel. Life-Line's only moving element "seesaws" on this bearing. It's friction free—can't stick or jam—will not operate falsely due to vibration or impact.
2. Snap-action bimetallic overload relay. Retains precise calibration—can't age, fatigue, oxidize. Will not fail if reset when hot.

In addition, Life-Line Starters are easy to mount and wire—save space, too. They are rugged—resist rough handling. And all parts are front-removable for top accessibility.

Get the best panels your machines ever had—get the outstanding advantages of both Westinghouse Circuit Breakers and Motor Control. Call your Westinghouse Representative for design data or application assistance, or write Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pennsylvania. J-30157

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Westinghouse

Keep Your on the OLIVER Line — Cost Cutting Production Boosting MACHINE TOOLS

OLIVER DRILL POINTERS

Properly machine ground drills give better performance. OLIVER Drill Pointers, with each lip doing equal work, give balanced cuts—more accuracy—more perfect holes—more efficiency—longer drill life.

As Illustrated:

No. 21 Oliver Bench Drill Grinder. Hand operated for Drills No. 57 to ½".

No. 510. For Drills ¼" to 3"—2-3-4 flute.

OLIVER DIE MAKING MACHINES

Efficient, speedy and accurate — effecting great savings in time and costs. Skilled labor is not required for sawing, filing and lapping operations.

Available in 5 Models.

Bench Model S-1 (Illustrated) — Single Speed Die Maker for use on Tool Steel up to 1" Thick.

Heavy Duty Model (Illustrated) — 6 speeds, works in metal up to 3" thick, has variable strokes to 5" with hydraulic feed.

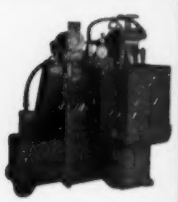
OLIVER ACE UNIVERSAL TOOL & CUTTER GRINDERS

Keep your most difficult cutters sharp with Oliver ACES. They excel on high speed and Tungsten-Carbide work. Direct reading for clearances reduces fatigue — eases operators' jobs.

The ACE excels for grinding face mills up to 15" — also, slab mills • slitting saws • all types cutters and reamers.

2 Models: Heavy Duty (Illustrated) and Standard.

OLIVER 20" TEMPLATE TOOL BIT GRINDER



Efficiently powered by a 3 h.p. motor, this OLIVER Machine grinds on the periphery of a 20" wheel. Capacity: tools up to 1½" wide x 1¾" high from 0 to 20° clearance. The OLIVER is developed for production sharpening of single point Tungsten-Carbide and high speed tools—offers increased production, lower tool costs and savings in man-hours. Extremely fine finish assured.

Write Today For Complete Information

OLIVER INSTRUMENT CO.

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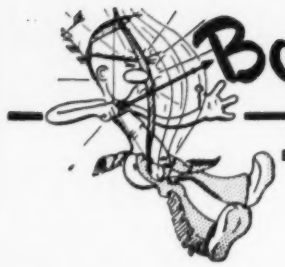


Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

OLD ISSUE

I have in my possession a paper published by you in 1890, which makes it over 60 years old. It is Vol 13, No. 17, of AMERICAN MACHINIST, published April 24, 1890.

Would this be of any value to you? If so, will you kindly confer with me and I will mail it to you. This paper gives all the facts about the Fire Boat, New Yorker.

Joseph M Ferguson
189 St James Place
Buffalo 22, N Y

KICKBACK

After reading "Rheumatic Hippo" in "Backlash" (*AM*—Aug 3 '53, p85) wherein Mr Roberts implied that the large spur gear in question would fly to pieces, I wrote up to Alberta Clay Products, Medicine Hat, to check up on the gear's performance. I hadn't for a moment held any hopes that it would still be in service but I thought that possibly there would be an old-timer or two around who would be able to shed some light on the effectiveness of the repair.

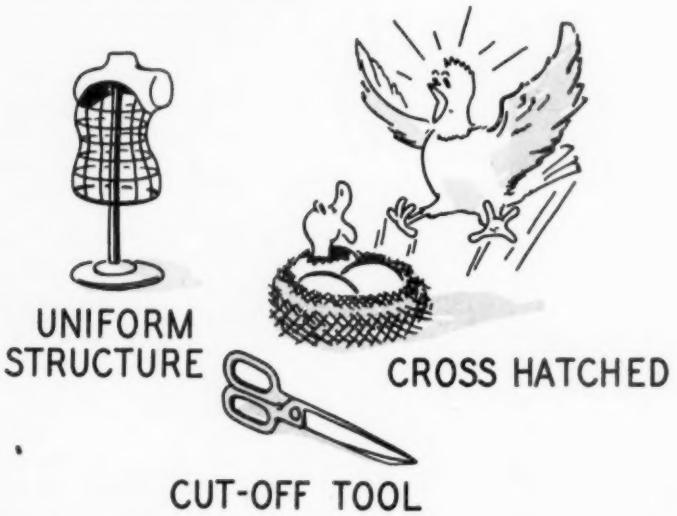
The reply informed me that the plant had since undergone a complete overhaul in equipment and personnel, and that anyone who could recall the incident was either out at the coast lolling sublimely in the drizzling rain, or else flipping around like a seagull in the beauties of yonderland. The desperately repaired spur gear had since gone through the process of transmigration and its valuable molecules were in all probability now serving in some other form.

So goeth the story of a gear which gave up the ghost at an inopportune moment and blushingly submitted to the ingenious mind of a foundry foreman. It may be bad practice, Robby, old boy, but the fine points in doing things are cast to the four winds in moments of desperation out on the windswept prairies where the war made it impossible to do things according to Hoyle.

However, nothwithstanding the unsightly appearnace of said bull gear whose cast-iron teeth ground away to involutional perfection through the grime and grit of its environment, my boss collected a hell of a pile of dough from a highly

GRINETICS

BY D G SMITH



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MACHINE TOOLS
DOORWAY to a proven method for solution of big and small metalworking problems

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

Kearney & Trecker offers NEW FREE BOOK on solutions to production metalworking problems

THIS illustrated booklet will show you how to make profitable use of our Special Machinery Division's new $5,200,000 expansion. In addition to demonstrating how to use our Customer Engineering Service, the book illustrates typical special machines and tooling already built... the more than $2,000,000 worth of equipment available to work on the machines you need. Fill out and mail this coupon today. There's no obligation, of course.

SPECIAL MACHINERY DIVISION
Kearney & Trecker Corporation
6784 W. National Ave., Milwaukee 14, Wis.

Please send me a copy of the booklet "Doorway to a Proven Method for Solving Big and Small Metalworking Problems."

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Company Name _____

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Let your operator tell you . . .

. . . why REID GRINDERS are the easiest to operate!

. . . Turn a good man loose with a Reid precision grinder for five minutes. The first thing he'll tell you is that a Reid grinder is the *easiest* to operate. Ask him why, and he'll point out these features:

. . . A competent operator knows a competent machine when he sees—and operates one. Reid's 50 years of experience in building grinders produce a *co-ordinated* design for greater efficiency of precise operation. That's why REID is the operator's preference throughout industry.

Write for latest illustrated bulletin (618-1) with specifications of power and hand feed Reid Precision Surface grinders.

Reid Brothers REID PRECISION SURFACE GRINDERS **Company, Inc.**

BEVERLY, MASSACHUSETTS

satisfied customer who was so pleased that we could help him bridge over a desperate period in his production schedule that he almost kissed us. That's one of the virtues of free enterprise: You can do as you please and ofttimes get away with it, as we did in this case.

John Homewood
Tujunga, Calif.

OLD AUTOMOBILES, ETC.

Your mention of the old steam automobiles (*AM*—Sept 14 '53, p183) brings back many memories, not all of them pleasant. I began driving a Toledo steamer in 1899. When I think of driving a car with a steam boiler fired by a gasoline burner under my coat-tails, I wonder how anyone could have been comfortable or felt at all safe. Stanley moved his boiler out in front, where the gasoline engine hoods are at present, and at least put it out where you could keep an eye on it.

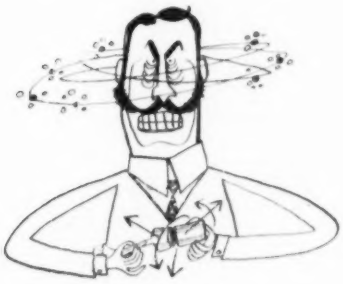
Not that there was much danger of boiler explosions, as they seldom occurred. The real danger was fire, which was all too common. But you hear drivers today who seem to feel that if engineers had devoted as much time to improving the steam car as they did to the gas-driven car, we might have been better off.

There was no special trouble with the steam engine. It was a simple and easily controlled unit which did not need to have shifting gears, although White later used a reduction gear to help a low-powered engine on steep hills. He also put in a condenser, which made it possible to run fairly long distances without stopping for water. The water tanks took up a lot of room at the back of the car.

What killed the steam automobile was not the engine but the boiler, just as it was the boiler which finally forced the railroads to abandon steam as a motive power. The steam locomotive was comparatively simple, much less complicated than the diesels which have replaced it. But

the boiler was the sore spot, the amount of trouble depending somewhat on the kind of water that had to be used in the boilers. The Norfolk & Western is probably the only road which sticks to steam, which is largely because it is primarily a coal road. They have always been a wide-awake road and their shops are especially interesting, but they have boiler trouble.

Fred H Colvin
Point Pleasant, N J



STABILITY OF GAGES

The article by Lt. Commander W Bubyk (*AM*—Sept 14, '53, p121) brings back memories of many years ago, about sixty as a matter of fact. It was one of my first contacts with Worcester R Warner of the Warner & Swasey Co at an early meeting of the ASME in New York. I'm not sure what started the conversation, but it must have been about gages, as he told me of his experience as a very young man with the Pratt & Whitney Co. They had made what was probably the first set of standard plug and ring gages for exhibit at the Centennial in Philadelphia, in 1876, and Warner was to go with the exhibit.

The gages were made of the best tool steel available and made a nice showing. For some reason, just why he never knew, he decided to check the gages before he took them to Philadelphia. Not a single plug would go into the ring supposed to go with it.

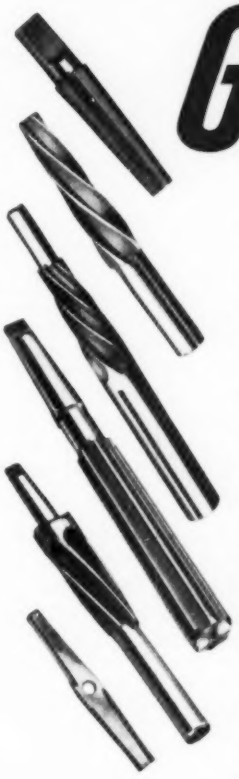
This was their first intimation that good tool steel would not "stay put," as he told it. There was not time to regrind all the plugs, so he had the 1-in. plug ground to fit the gage and went to Philadelphia. This was the only gage he ever took out to show visitors. It taught them about the growth of steel in a way they never forgot.

The matter is of great importance to manufacturers of precision equipment and should be a subject for much more detailed research.

Fred H. Colvin
Point Pleasant, N J

FOR SPECIAL REAMERS . . . REMEMBER

GORHAM



They may not *look* alike, but all of the special tools on this page share a common function . . . *because every one is a reamer!* Each was engineered and manufactured by Gorham Tool Company to provide a practical solution to a specific production machining problem for one of our customers.

Actually, these reamers represent just a few of the many special-purpose cutting tools produced by Gorham. Others include milling cutters and end mills, inserted blade cutters, flat and circular form tools, profile cutters, and carbide tipped tools of every description. Gorham "specials" are turning problems into profits in thousands of plants every day . . . and the one we engineer for you will solve *your* next production machining problem, too! Take advantage of our experience.

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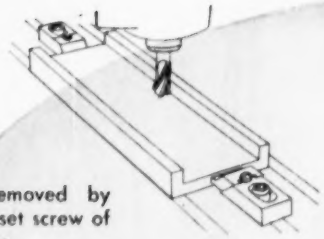
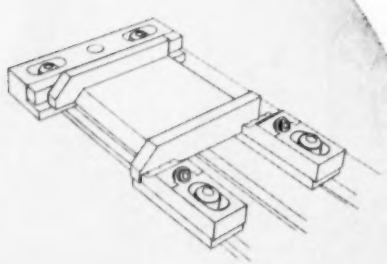
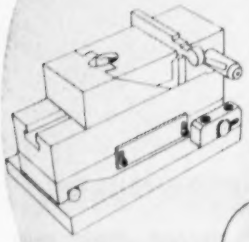
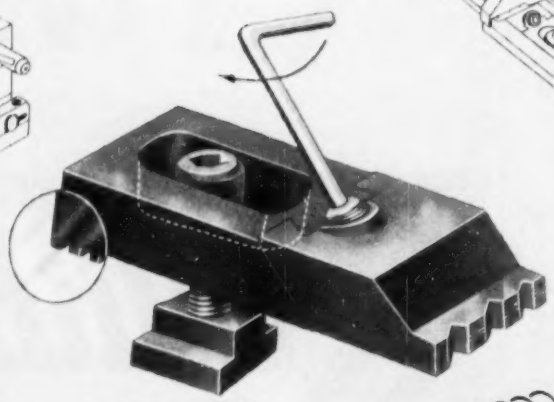


Work-piece removed by loosening one set screw of one clamp only.

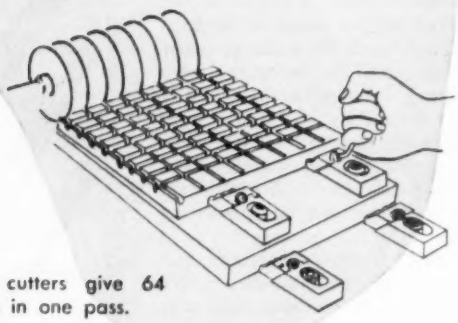






J & S Double Half Vise, for use on jig borers, millers, planers and shapers.

Precision Grinding Vise with or without sine bar allows rapid unloading and exact relocating.



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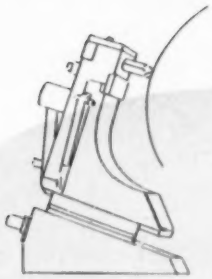

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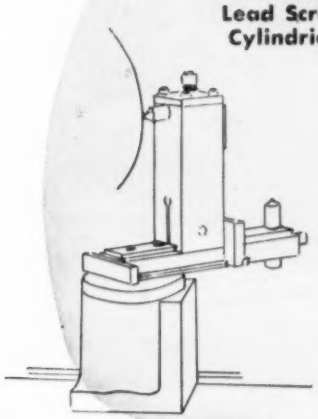

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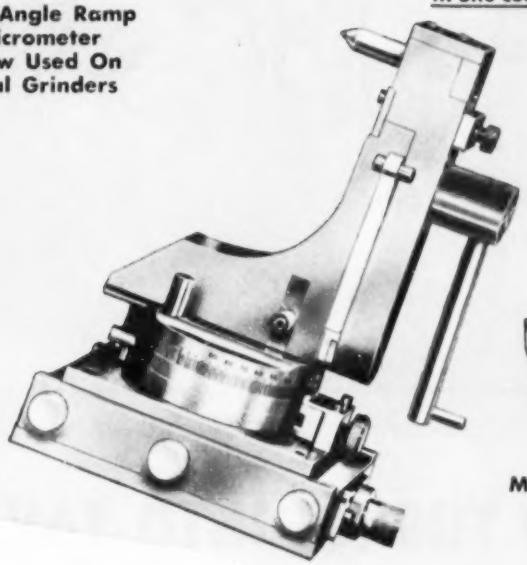

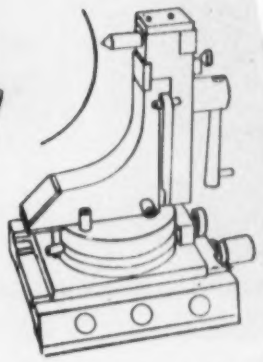

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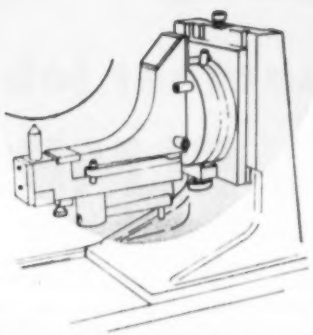

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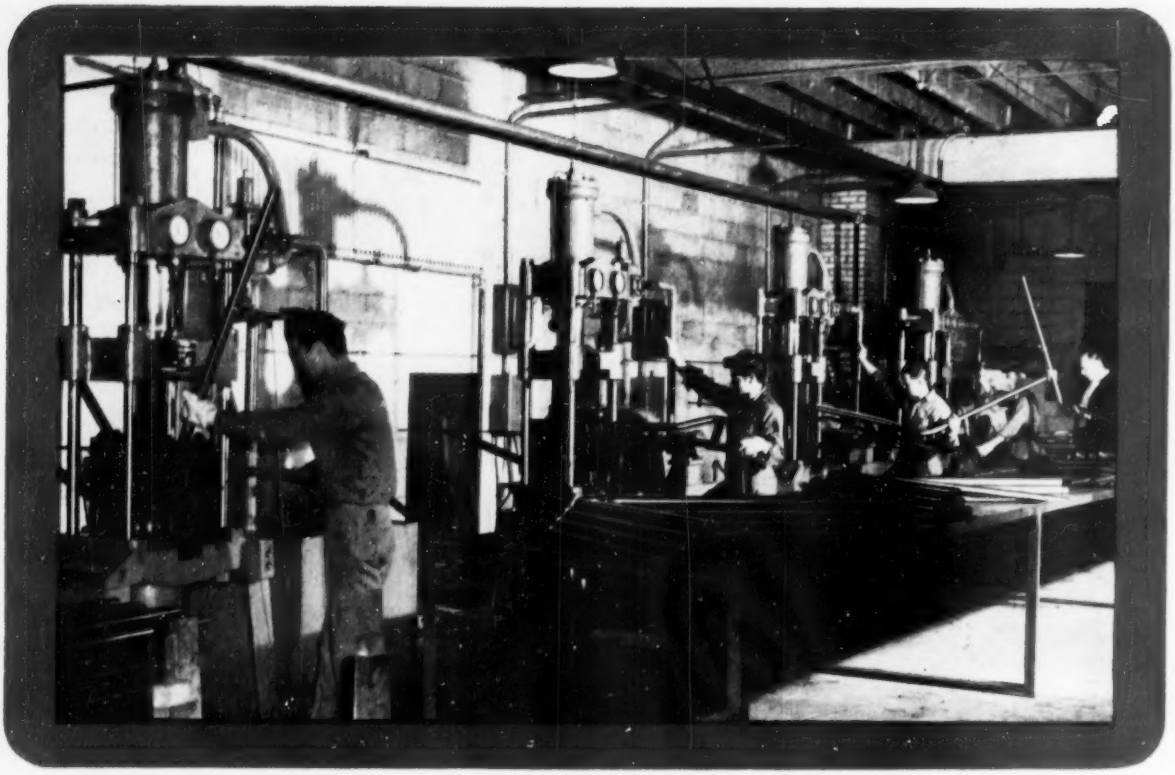

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SPOT NEWS of Metalworking

- **Philippine industrialists are lobbying to maintain duty-free trade** between the US and that country. Bell Act calls for end of free trade July 4, 1954. After that, US machine tool builders would have to pay duty of 1% first year, 2% the second — up to 20 years, the level of non-US import duties. But Filipinos know import duties work both ways, prefer status quo.

- **Ceramic permanent magnets fab.icated by powder metallurgy techniques** are now on the market. They retain magnetism even in highly demagnetizing fields.

- **"Rosie the Riveter" is making a comeback.** Boeing Airplane Co reports almost one-fourth of its 62,000 workers are women, while five years ago only 14% of its work force was made up of the fair sex.

GE is building a record-playback control that directs machine operation from information stored on a magnetic tape for Giddings & Lewis Machine Tool Co. Control is expected to double production speed of a milling machine to be used in making skin structures for jet aircraft. Other possible applications: die-sinking machines, flame cutters; weight, pressure, humidity, density and conveyor speed controls; valve operation.

- **Controls on civilian use of nickel will end November 1.** But, says ODM's Arthur Flemming, supply won't meet demand for several months.

- **British independent automakers are worrying about getting bodies made.** Most of them rely on outside sources. Recently, two of the largest body-building firms were gobbled up by British Motor Corp and Ford Motor Co, leaving only Pressed Steel Co and a few small firms as sources for the independents.

- **Harder, tougher, tungsten carbides, usable to 1800F,** were announced at the Metal Show by Carboloy. They open up new horizons for higher machining speeds and heavier cuts.

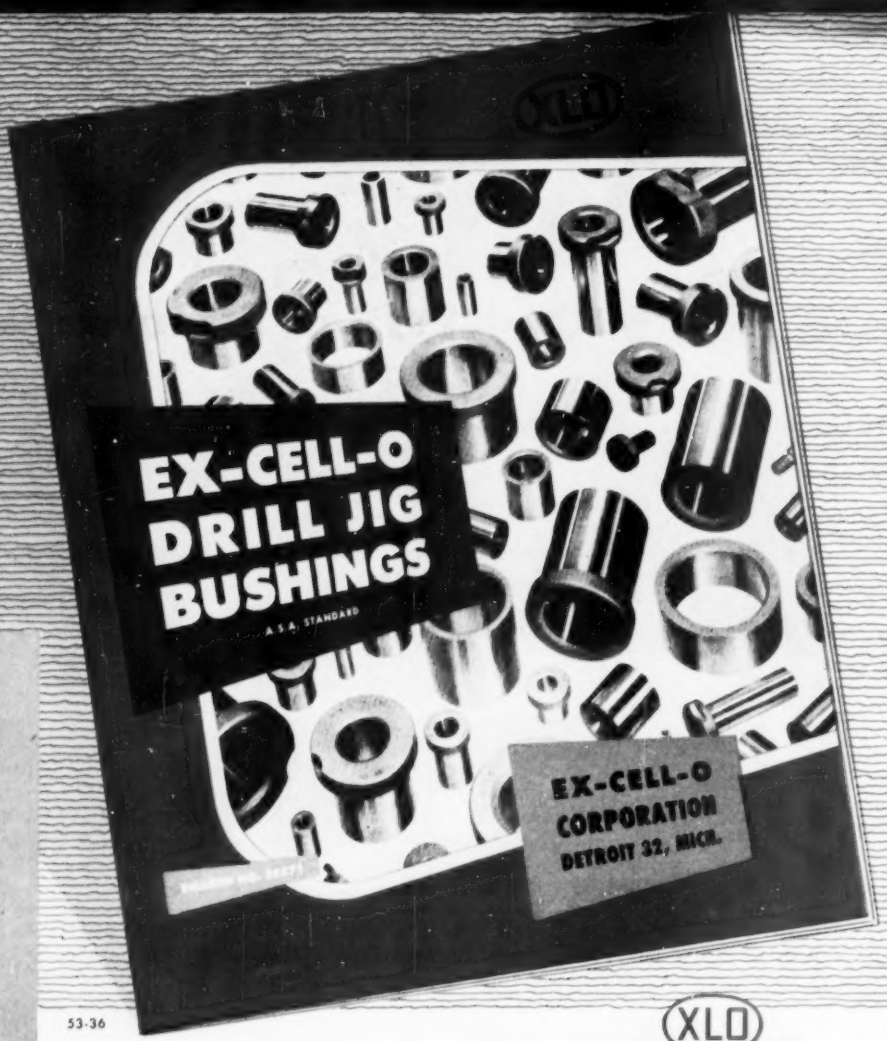
- **Kaiser Motors Corp's new labor contract** provides for one steward for every 200 employees, reduces minimum number of stewards from 96 to 12, provides greater work force flexibility through reduction of job classifications.

- **Japan's Mitsubishi works will purchase $1 million worth of machine-tools** from the US and other sources for the production of 100% made-in-Japan Willys jeeps and station wagons within three years.

One prominent Midwest machine-tool builder saw the handwriting on the wall when badly damaged GM fire machine tools were brought in for rebuilding. Result: the machine-tool firm has started a plant-wise fire prevention program of its own, with supervisors forming trained fire brigades made up of key plant personnel.

- **Research on gas turbine engines for automobiles** is said to be underway at Ford Motor Co, Detroit.

- **Yugoslavia is reported to have expanded its industrial capacity** considerably the past few years, including construction of the IVO LOLA RIBAR plant, employing over 2000 workers, and building heavy lathes, other machine tools.



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Washington

Eisenhower's economic advisors are changing their minds about the business outlook. Only a few short weeks ago, they were stressing the view that everything looks cheerful as far ahead as they could see.

Now they're beginning to give equal attention to the soft spots in the economy. They're watching to see to it that existing softnesses in various lines don't get together to produce a combined impact that might be the start of a general business recession.

So far, they see nothing that looks like a recession in the offing. So Eisenhower will go along for the time being with the administration's present money and credit policies.

• • •

Nevertheless the Eisenhower aides whose job it is to do what they can to keep the economy healthy have informally picked out some "danger points"—indicators they're watching to tell when they might have to step in with action to stimulate business.

Here are some of the "break points" they'll use as a guide to anti-recession measures: steel—if output should drop from present 95% to 90% or even 85% of capacity; autos — if production should go from the 5.9 million indicated for this year to less than 5 million; housing—if new starts should drop from this year's 1.1 million to less than 900,000; farm prices—if they should slide off any lower than they now are.

• • •

The administration has filed its first big antitrust suit. And it has the look of the same kind of case businessmen have been used to seeing filed by the Democrats during the past 20 years.

The suit is against American Smelting and Refining Co and the St Joseph Lead Co for monopolizing the lead industry of the US. The government's complaint charges that by means of long-term contracts with each other over the past 30 years the two companies have controlled about two-thirds of the lead sold.

One obvious reaction: "The Democrats had the industry under observation all these years — that's certain—and never filed a suit. Now out of the blue the businessman's administration says we've been violating the law all long."

• • •

The new military budget for fiscal year 1955 is now being hashed over by top Pentagon officials. The figures are not final as yet, but indications are that the original estimates based on the new Joint Chiefs of Staff review were high. So, Defense Boss Wilson is sitting in with the top admirals and generals in hopes of cutting down some of the programs.

But Wilson is having tough going. For one thing, the recommendations made by the new JCS were unanimous. And too, Wilson himself is coming around to the belief that defense funds have already been cut to limit—maybe too far. So he's trying to hold the government's defense spending figure to around $40 billion for fiscal year 1955.

It's a switch for Wilson. A few weeks ago he claimed that maybe an additional three to four billion might be cut over the coming year, thus continuing the downward trend of defense spending. Now he won't publicly state that there's any room left in which to whittle down defense expenditures.

• • •

Continental defense, of course, is the key (see page 162). The administration is bearing down hard on defense of the US proper. It's sadly lacking. And to beef it up will cost a lot more money. That's why the Republicans are soft pedalling talk about a balanced budget in fiscal 1956. And, in fact, Budget Director Dodge is now saying that a balanced budget two years hence is more illusory than real.

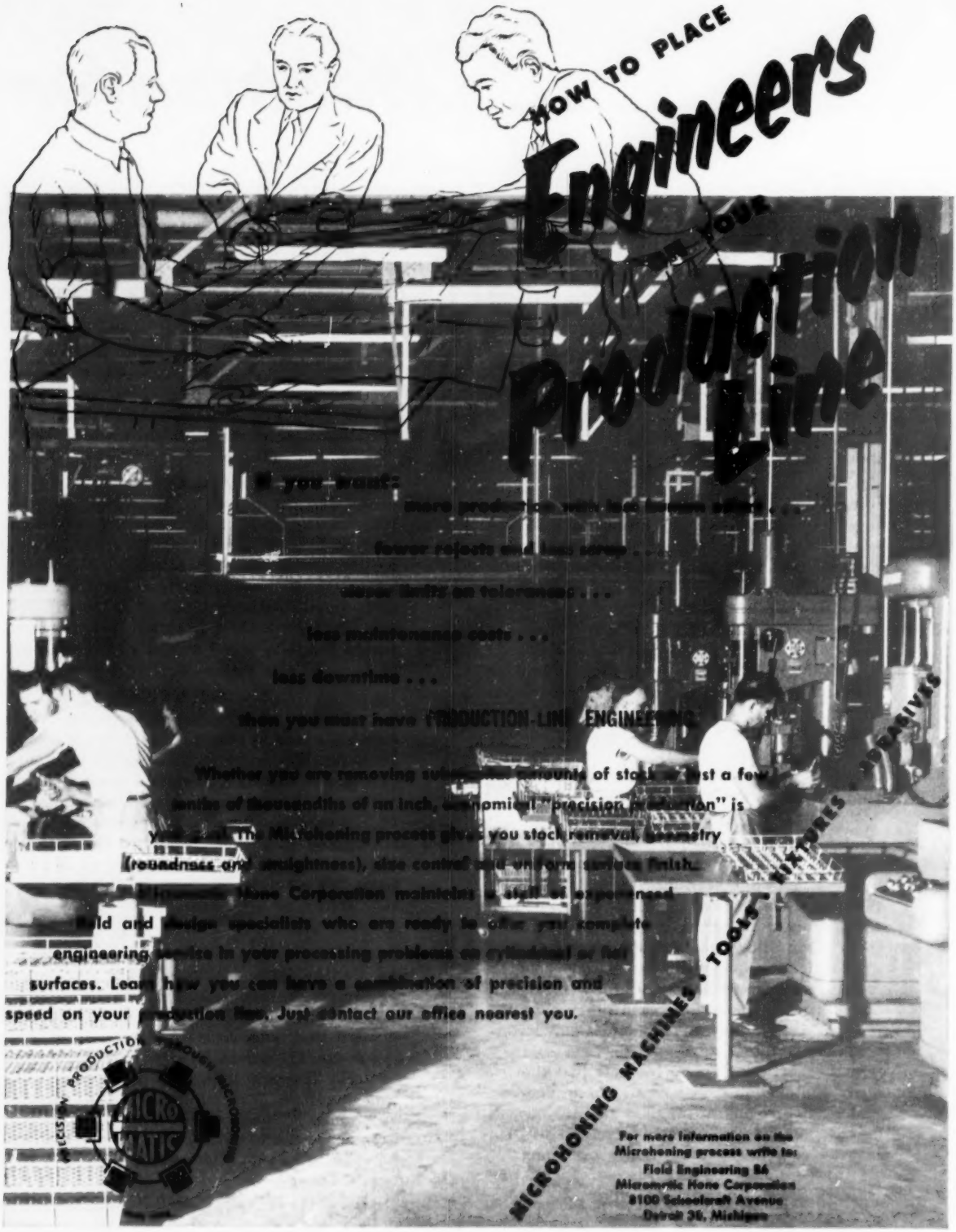
• • •

Wilson is dusting off his dual-purpose plant idea once again. Up to now it hasn't met with much favor in Washington. But Wilson is hoping that it will catch on now that pressure is off some weapons production and there may be the chance to build new plant capacity under a continental defense program. He will use GM's Arlington, Texas, plant as an arguing point. It's a new plant, with civilian and military ability, and, it's not close by an A- or H-bomb target.

• • •

US and Canada have reaffirmed their three-year agreement on economic cooperation in mobilization matters. This means continued coordinated programs on such things as defense requirements, production, procurement, and controls. The new agreement was made earlier this month in Washington by ODM Director Flemming, Treasury Secretary Humphrey, Commerce Secretary Weeks, Deputy Defense Secretary Kyes, and Canadian Defense Production Minister Howe.

They agreed that (1) "the US and Canada can better defend themselves and do justice to their world-wide commitments by viewing defense problems as continental rather than national," and (2) "the effective utilization of joint resources is fundamental to the joint defense and the economic strength of both the United States and Canada."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Detroit

Annually at year's end the Automobile Manufacturers Assn gathers together representatives of the automotive press to sample opinion as to car and truck production for the following year. These estimates sometimes appear to be based on rather unconventional economic theories.

"Informed guesses" made last December on 1953 passenger car production range from a low of 4.2 million passenger cars to a high of 6.5 million for an average of 5.2 million. Car production this year will in fact amount to about 6 million.

But if some writers are now embarrassed about their prediction for 1953, they need only look to the auto industry itself for comfort. Auto company statisticians vary almost as widely in their estimates of the 1954 market as the writers differed last year.

A survey shows that companies willing to be quoted figure output next year will range from a low of 5.25 million (Ford) to a high of 5.9 million (General Motors). In between the rosiest and the least optimistic: Nash and Chrysler, 5.5 million; Packard, 5.3 million; Kaiser-Willys, 5.35 million. Other makers refused—perhaps wisely—to go on record.

While disagreement is on a relatively narrow scale, the spread between high and low estimates nevertheless is large enough to indicate that at least a pinch of guesswork goes into the "scientific" predictions of auto economists, statisticians and salesmen.

Even so, makers seem agreed that while the new year won't see sales records splintered, 1954 probably will be the third best auto year.

• • •

Those who have read the proofs say that Edward T Ragsdale's story on how an auto company tackles production problems is one of the most lucid and absorbing documents ever to be published under a manufacturer's byline. Ragsdale, general manufacturing manager at Buick, wrote the report for the next issue of GM's *Engineering Journal*.

• • •

Kaiser's V-8 program is on schedule and pilot line production should be underway in June. Initially, rate of production of the new V-8 is set at 25 per hour, rather small by any standard. Comments of machine tool makers suggest that Kaiser is watching costs in a manner hitherto unknown — altering machines on hand to do the job wherever possible, rather than buying entirely new machines.

Latest word on K-W consolidation plans is that the Henry J will be dropped from the line and that one of the Kaiser engines will go into the Willys.

CIO Auto Workers Union is warming up to its next large task: Winning the guaranteed annual wage.

Last May, Walter Reuther notified auto managements that they were, in his opinion, producing so many cars in the first half of the year that mass unemployment would result.

Companies, which had not solicited Reuther's advice, countered by observing that customers—not management nor the union—fixed demand, and that while it was up, demand had to be met.

Spotty lay-offs through Chrysler divisions recently prompted the union to warn that workers had reached a "stage of protest" and were in a "rebellious state of mind."

Chrysler's report: Effects of a UAW strike in Detroit tool and die shops last summer continue to plague production schedules; further, model changeovers were causing temporary layoffs, as they do every year.

Essence of the entire dispute: UAW is ruffling feathers, conditioning workers for the guaranteed wage siege.

• • •

As the market now stands, either side can make a fair case for itself. Auto output has moved well beyond the 5-million mark and total car and truck production exceeds 6-million units. Registrations through August exceeded 3.9 million and an estimated half-million cars were sold in September. Dealers, therefore, are carrying about 500,000 new cars.

Whether that amounts to an undue burden or not won't be known until the clean-up season is well underway. Undeniably, an important number of dealers have panicked and begun unloading stocks on customers' terms.

Factory programming, however, indicates that 1.25 million or more cars will be built in the fourth quarter. Certainly no hysteria is evident in that.

Least perturbed of all are Chevrolet and Ford, who are producing about half of all cars coming off assembly lines. Ford, which for three weeks held the unique distinction of outproducing GM's big division, fell slightly behind in early October, but continued to rewrite company records.

• • •

Sales of Ford passenger cars for the third quarter were the highest in 24 years and September sales were the highest in 29 years.

Mercury set all-time monthly sales (34,768) and production (36,432) records in September but Mercury's stablemate, Lincoln, remained out of production. Closed down in early September by lack of Hydra-Matics, Lincoln will stay down until it begins its 1954 model run in November.

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Here's high production — low cost carbide planing at the Beloit Iron Works, Beloit, Wis. This GRAY OPENSIDE PLANER CUB is running 300' per minute, day in — day out, carbide planing packing strip holders for suction rolls of paper making machinery.

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DEPT. A *The G.A.* **GRAY** *Company*

planers • milling planers
planer type milling machines
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SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. • SOLD IN LATIN AMERICA BY MACHINE AFFILIATES

Machine Tools

Mitsubishi, famed Japanese company, expects to buy $1 million of machine tools abroad to tool up for manufacture of Willys jeeps, station wagons and personnel carriers.

The exact list of machine tools has not yet been determined. But it will include gear cutters, broaching machines and grinders.

It appears likely that much of the tooling will be bought in this country. The manufacturing program is essentially a part of the armed services' offshore procurement program.

• • •

Mitsubishi plans to produce 100% made-in-Japan Willys units within three years. It will assemble jeeps from Japanese and American parts at present.

674 jeeps already have been supplied to Japan's security forces. Japanese-built bodies, radiators, batteries, instruments, fan belts and head lamps, were used.

Japanese brakes, controls, frames and electrical parts will be in production by 1954.

Manufacture of engines and transmissions is scheduled for 1955. Front and rear axles are the final parts scheduled for production in Japan.

• • •

Mitsubishi will pay Willys royalties of $100 per vehicle, if output exceeds 3000 per year; $125 if assemblies are 2000-3000; and $150 if output is less than 2000 a year.

Production this year is put at 1500 units. But annual assemblies hereafter are estimated at 4000-5000.

• • •

Contract between Mitsubishi Heavy Industries Reorganized Ltd and Willys-Overland runs for five years, with renewal clause for another five.

Willys will provide engineering drawings and all techincal information, will train Mitsubishi engineers at Toledo, and will send its engineers to Japan.

• • •

Engines, transmissions and transfer cases are to be made in Mitsubishi's former aircraft engine factory in Kyoto. Bodies, frames, axles and other parts will be produced in Mitsubishi's former airframe plant at Nagoya.

The Mitsubishi tooling program on Willys units is believed to be the beginning of a broad expansion of metalworking activities in Japan that will require American machine tools.

• • •

Financing of this expansion is regarded as the critical issue. A substantial portion of the money may come from offshore procurement dollars of the armed services and from MSA.

A number of U.S. machine tool builders have already sent sales representatives to Japan, feeling that there will be a sizable market there for their products.

• • •

Action has been started in Washington to get rid of NPA's famous Regulation M-41.

M-41 specifies that all machine tool builders with machines on the so-called critical list must allocate 70% of those machines to the Armed Services as long as the military requirements are at or above that level.

The Armed Services may take up to 60% of machines not on the critical list. More to the point, builders in the non-critical classification may set aside at least 40% of their production for civilian customers.

Much of M-41 is little more than academic today, because machine tool builders' orders on the average are mostly for civilian requirements.

Only 17% of incoming business carries military priorities. And that is a good reason for discarding M-41. It no longer serves a useful purpose.

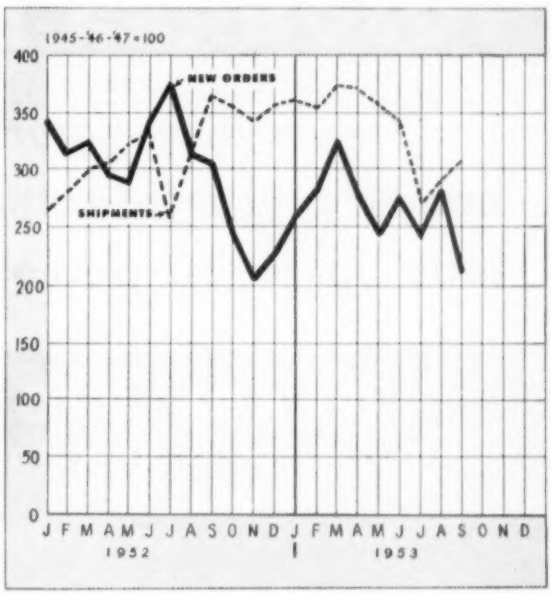
Regulation 2 would succeed M-41. It would provide merely that any order carrying a rating would be given preference over a non-rated order.

BF

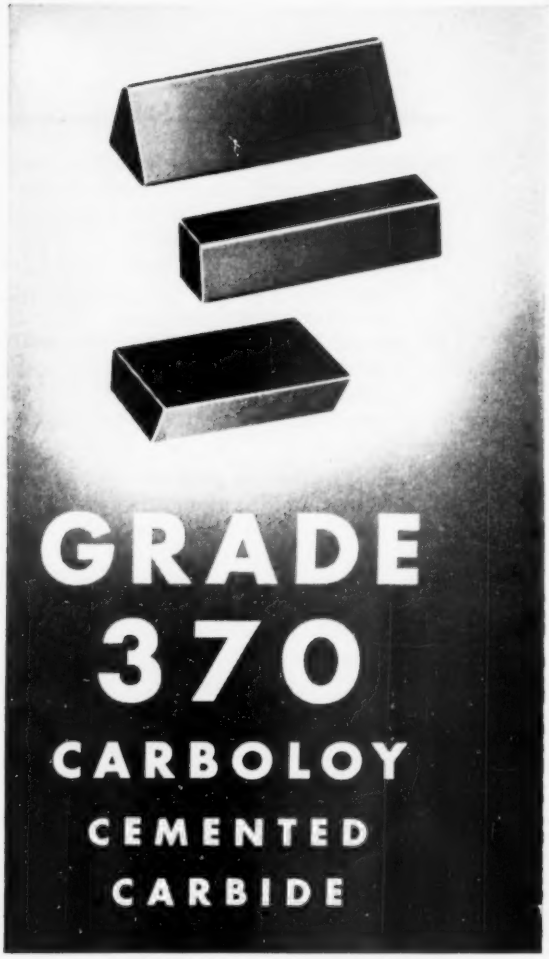
MACHINE TOOL INDEX
(1945-47 = 100)

(Source: National Machine Tool Builders' Assn.)

Note: September figures are estimated. Several machine-tool firms had not reported at press time



A NEW CARBOLOY® CREATED-METAL



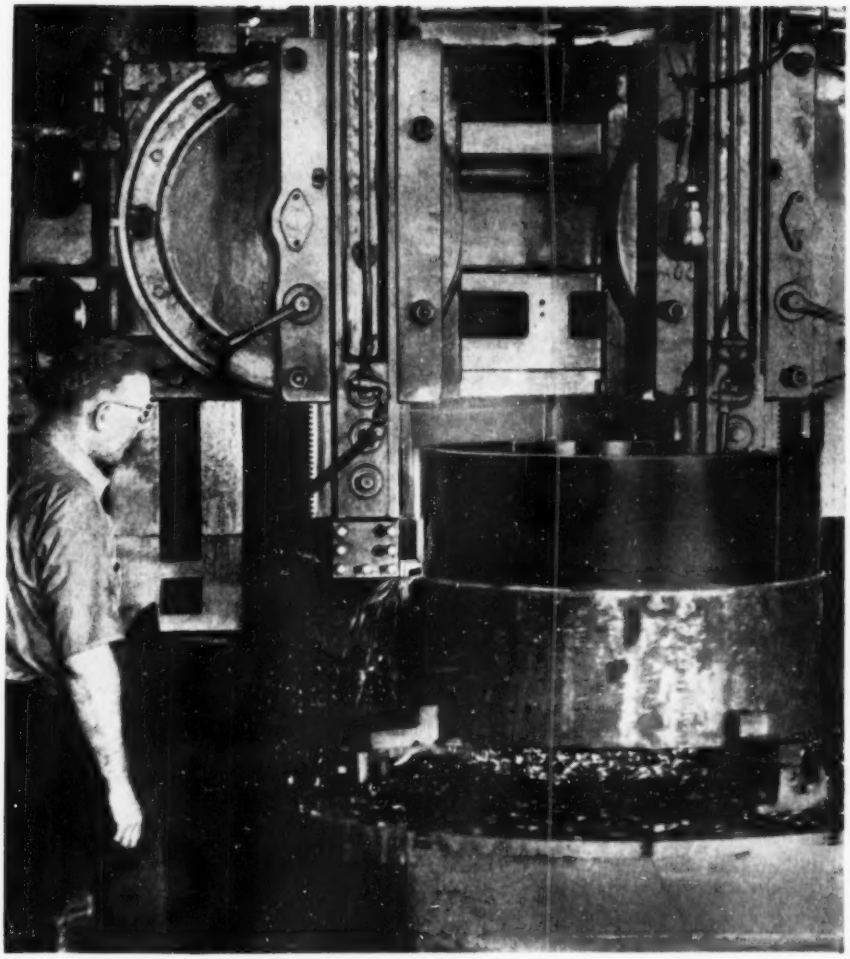
A heavy-duty carbide capable of cutting more cubic inches of steel per minute, with longer tool life, than existing carbides

. . . speeding your heavy-duty steel-cutting jobs up to 30 percent!

GRADE 370
The first of a new family
—Series 300—
of steel-cutting carbides

It's Grade 370 Carboloy Cemented Carbide – the first of an entirely new series specially developed for taking heavy cuts in steel at higher speeds. Unique grain structure lets it cut at around 1800° F without deforming – *higher than ever before practical* with any carbide. Tests and on-the-job applications indicate that Grade 370 can increase performance on many higher speed steel-cutting jobs by up to 30%. Now available in selected standard sizes and shapes.

"Carboloy" is the trademark for the products of Carboloy Department of General Electric Company



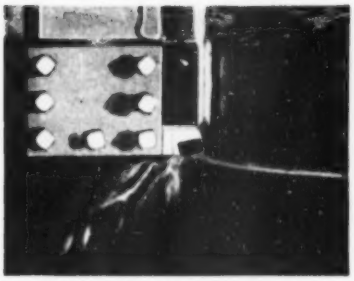
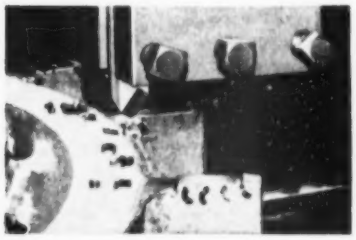


Photo at left and close-up, above, show Grade 370 taking a cut ½" deep, in large generator retaining ring of cast-alloy steel. The ring is machined at 110 FPM with .048" feed – causing tremendous heat to build up at the cutting edge. Grade 370 holds its shape and cutting edge under these tough conditions. Tool life increased 50%.



Above, Grade 370 machining generator stator frame. On this job a ½"-deep interrupted cut is made at a speed of 80 FPM with a .024" feed. Grade 370 continues to cut for longer periods under the constant jarring and high temperatures. Tool life increased 50%.

Grade 370 is the first of a new cemented carbide series tailor-made for today's *and tomorrow's* most severe metal-cutting conditions. The result of a quarter century of research- and development-pioneering in created-metals by the Carboloy Department.

MORE PERFORMANCE FOR YOUR DOLLAR

Its cutting superiority has been proved both in Carboloy laboratories and on tough on-the-job customer applications. On rolls, gun barrels, locomotive wheels and other heavy-duty operations, tools tipped with Grade 370 take heavier cuts at higher speeds and withstand higher temperatures than ever before practical – and this is done with even longer tool life than existing carbides. Tools cut more cubic inches of steel per minute . . . production goes up as much as 30%.

BUILT-IN TIP RIGIDITY

Exhaustive tests by Carboloy engineers showed that on heavy-duty, high-temperature machining applications where heavy pressure is encountered, other tools failed because the cutting edges deformed. Grade 370 is made from start to finish with a new, carefully controlled manufacturing process which gives it a built-in structural rigidity to resist this deformation – even at temperatures of around 1800° F.

AVAILABLE NOW

Grade 370 is available immediately in a number of sizes and shapes. Write today for additional information and for free technical literature. Carboloy Engineering Appraisal Service will work with you on specific applications.

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY

11149 E. 8 Mile Avenue, Detroit 32, Michigan

Gentlemen: Rush me, at no cost or obligation, all facts now available on your new Grade 370 Carboloy Cemented Carbide.

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Try an AVEY once . . .

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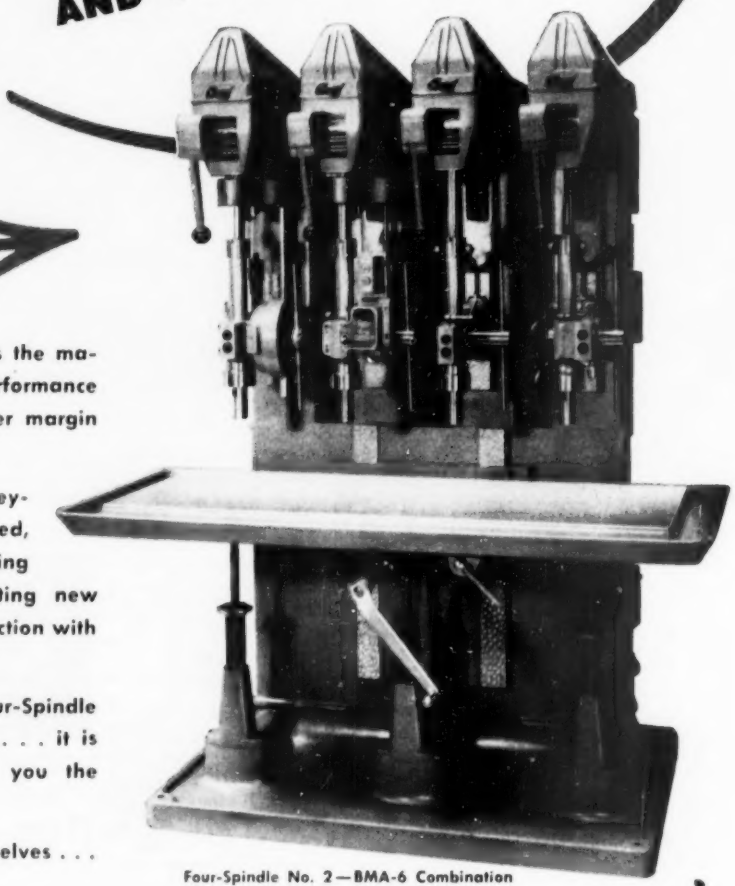

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Even your unusual problem will become routine if you use the services of Avey engineering.

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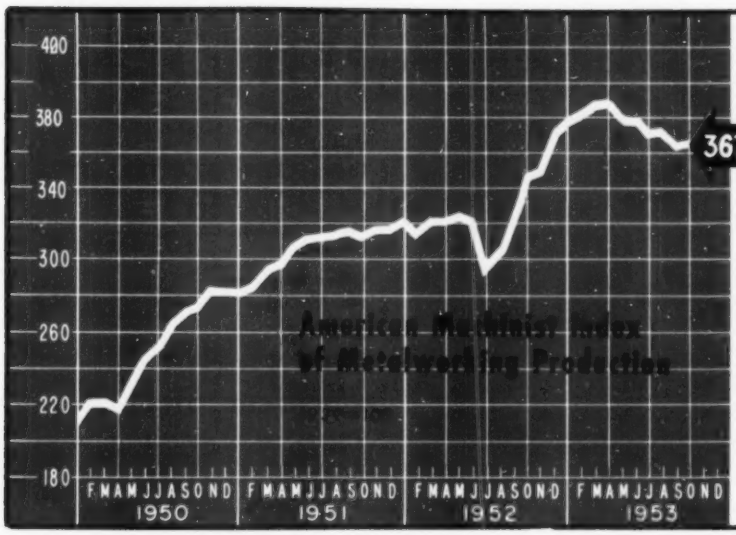
Gaging Metalworking



PRODUCTION INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	SEPT '53(*)	AUG '53(p)	JULY '53(r)	SEPT '52
Tot. Index..	367	367	364	330
Machinery	317	320	303	
Electrical Machinery	425	418	383	
Autos	297	286	242	
Other Transportation	603	601	550	
Other Metalworking	367	365	325	

*) Estimated (p) preliminary (r) revised

Metalworking operations continue at such a high rate that any reduction in output is hardly perceptible.

Yet a gradual tapering is actually taking place. It will probably persist through the fourth quarter but will not be sufficiently pronounced to cause much of a stir.

Truth is that the October-December period will be one of the best final quarters on record.

Almost all the slippage in production has occurred in durable goods. Yet the chief sustaining power of metalworking still comes from durables—all the way from industrial machinery to defense products.

Consumer durables, of which automobiles and trucks are a prime example, are doing very well, too. Especially for this time of the year.

• • •

Don't dismiss too lightly the continuing influence of the defense program upon metalworking production.

There have been some cutbacks and layoffs, especially among so-called secondary sources. But output remains impressively large.

Indications are that armament needs will continue indefinitely to be an influential factor in sustaining metalworking activities.

• • •

Materials have almost disappeared as a major worry. Steel supplies, for one, have been built up to about normal size.

But a drop in automobile requirements and a cessation of inventory building by users may well bring down the steel ingot rate below 90% in the next 30 days.

Finished steel stocks grew some 2-million tons in the first half of the year, have risen even further since then.

• • •

Metalworking employment stays astonishingly high. Only in a few isolated instances, such as in the farm equipment sector, have layoffs amounted to much.

Shortages are still reported in skilled men and engineers from many metalworking centers.

• • •

Tool and die shops are doing very well, with most of them working 45-50 hrs a week.

Only a few have gone back to a 40-hr week. There seems to be plenty of business to be had if the shops dig for it.

The pace may be a bit slower later on, but no one is worrying about it now.

Shop owners feel a considerable amount of defense work will come their way within the next six months.

New England tool and die shops are prospering from work placed by the electronics and business machines industries.

• • •

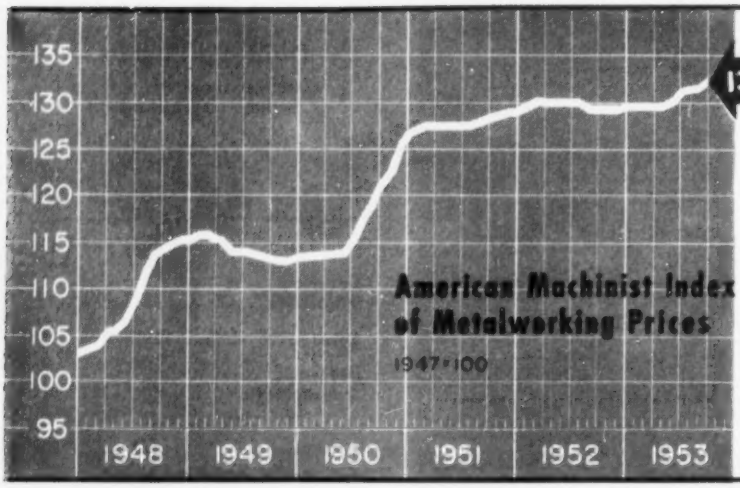
Railroad car builders say their backlogs are dwindling fast now that they can get plenty of steel.

Accumulated orders are less than half of the volume a year ago. Railroads some time ago set a goal of 1.85 million freight cars in service—126,000 more than were in service in July 1950.

To date, only 36% of the increase has actually been accomplished, whereas it should have been 75%.

Government is demanding that carriers add 80,000 cars to their fleets.

Gaging Business



PRICE INDEX

	SEPT '53(*)	AUG '53(p)	JULY '53(r)	SEPT '52
Total Index	**132.4**	**132.4**	**132.1**	**129.6**
Metalworking Machinery	**141.6**	**140.9**		**138.0**
Other Machinery exc. Electrical	**136.8**	**136.4**		**132.2**
Electrical Machinery	**131.1**	**130.7**		**124.6**
Fabricated Metal Products	**129.0**	**128.8**		**128.0**

(*) Estimated (p) preliminary (r) revised

Gross National Product (total value of output of goods and services) is $371 billion for the third quarter.

This is only slightly under the second quarter figure of $372.4 billion.

The decline is so small that the rate of error involved in calculating Gross National Product could mean that no change has taken place at all.

As the figures stand it is significant that this is the first time since 1949 that GNP hasn't risen from quarter to quarter.

• • •

Business inventories (manufacturers, wholesalers and retailers) rose $450 million during August.

More than 80% of the rise was in higher manufacturers' stocks. Retailers' inventories rose slightly, and wholesalers' stocks recorded no change.

August manufacturers' inventories totalled $45.8 billion. On a seasonally adjusted basis, August was $370 million higher than July.

Durable goods manufacturers added less than $200 million, non-durable producers slightly more, but this was the largest soft goods inventory increase since April.

• • •

Defense equipment producers are liquidating their stocks following an earlier rapid buildup. But the primary metals and electric machinery industries are accumulating inventory.

• • •

Manufacturers' new orders have declined two months in a row. August orders totalled $23 billion—about 6% below July's.

Only metal fabricating firms showed any gain in the durable goods field.

• • •

Manufacturers' shipments ran about $25.3 billion in August—a less-than-usual seasonal gain for the month.

Biggest gain: electrical machinery. Biggest declines: primary metals, ordnance.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-25 = 100)*	253.2	253.5	247.2
Steel ingot production (thousand tons)	2,129	2,146	2,211
Electric power output (million Kilowatt hours)	8,307	8,414	7,698
Production of automobiles and trucks	146,479	142,824	138,035
Engineering construction awards (*Eng. News-Record*, millions)	$268.9	$170.0	$333.3

MONTHLY BUSINESS INDICATORS

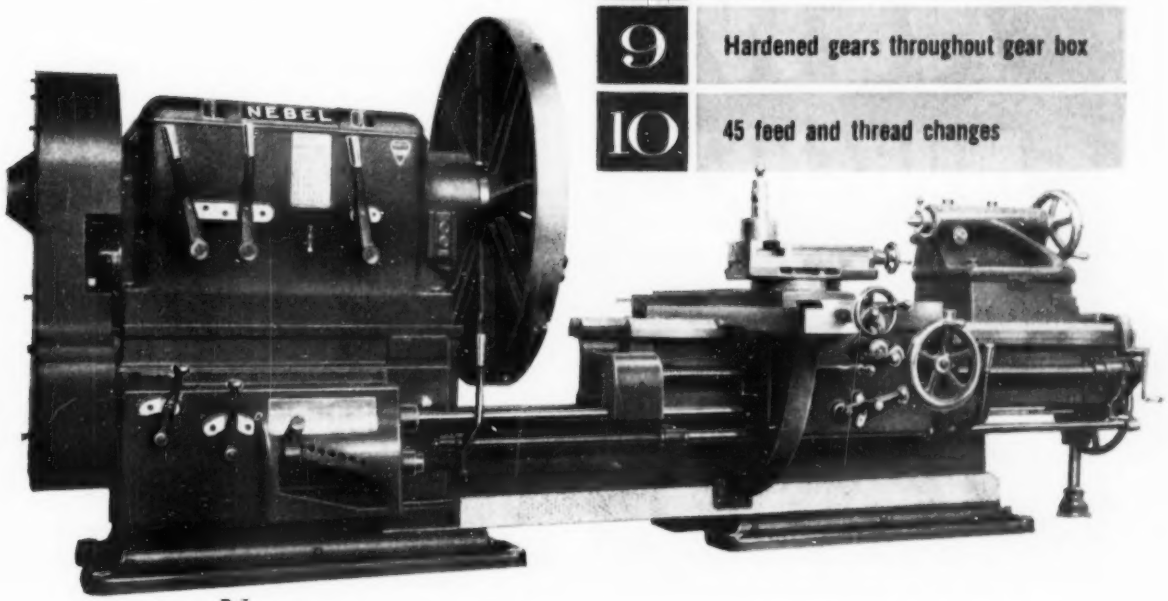
	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	233	330	273
Vacuum cleaners sales (thousands of units)	185	159	222
Washers sales (thousands of units)	291	228	255
Household electric ranges sales (thousands of units)	74	80	77
Radio production (thousands of units)	992	674	544
Television production (thousands of units)	604	316	398
Gear sales index (1947-49 = 100)	121.6	120.7	132.3
Foundry equipment new orders index (shipments, 1937-1939 = 100)	633.3	440.8	311.6

* Seasonally adjusted

10

big reasons why Nebel is your best buy in gap lathes!

1	Gap open . . . it's a gap lathe!
2	Gap closed . . . it's an engine lathe!
3	Timken equipped headstock
4	Shaved and hardened headstock gears
5	Heavy tailstock easily moved with crank
6	Electric power moves sliding upper bed
7	Hardened gears throughout apron
8	2-station spindle control
9	Hardened gears throughout gear box
10	45 feed and thread changes



Nebel extension bed gap lathes are so useful, accurate, easy to operate and so economical . . . that they have won themselves a prominent place in the metalworking industry. With their flexible swing and center distance capacity they can do the work of two ordinary lathes. Made in two sizes: 20"/40" and 28"/50". Why not send for descriptive bulletins today?

THE NEBEL MACHINE TOOL CO., CINCINNATI 25, OHIO, U.S.A.

Nebel

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WORKHORSE OF THE METAL WORKING SHOP SINCE 1899

NEW MURCHEY 4 IN 1 SELF-OPENING DIE HEAD

The new Murchey Self-opening Die Head is a versatile tool.

1. Cuts machine screw threads—3/32″ to 6″
2. Cuts pipe threads with a receding action—1/8″ to 5″
3. Used as a rotating tool on automatic screw machines or drill presses
4. Used as a stationary tool on turret lathes and hand screw machines

Fifteen sizes available

Write for Murchey Catalog MU-1052

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Lower Cost per Thread

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Any Old Thing Won't Do Anymore

Business is not hard to get if you have what the customer wants.

Take the case of the automotive production man who was going through a machinery builder's shop. He saw a brand-new type of machine not yet on the market. He watched it at work and found that it cut metal in one-sixth the time it now takes. He ordered one of the machines on the spot.

Then there is the experience of another machinery builder who is adding a new machine to his line. Its performance is spectacular and its cost savings impressive. He already has orders for 76 of the new machines though he has constructed thus far only a prototype.

These two instances are not isolated. They are duplicated by the experience of many other builders who are alert to the needs of their customers for reducing labor costs.

Yesterday's product will not do today. Today's product, if of new design and if geared to newly developed competitive requirements, is in good demand.

This situation extends far beyond the confines of the machinery building industry. It exists throughout Metalworking and throughout industry as a whole.

Everything relating to a company's business will be put under the microscope as the superboom fades. No product, no material, no production process, no machine will be immune. It must prove its competitive worth or be replaced.

The meaning of all this is clear. There will not be a nice comfortable market for anything and everything produced. People no longer will stand in line for a new car loaded down with expensive accessories. The car had better be good or they won't buy it even if the accessories are offered for free.

Sounds discouraging? Not at all. It merely means that the time for taking one's ease has ended. Sales will not be self-perpetuating.

No manufacturer will be able to operate successfully unless he has an up-to-date product that is priced right and that the customer really wants and needs.

There is no good evidence to show that purchasing power is drying up. Buyers are just becoming more selective. They are not in the market to grab up any old thing anymore.

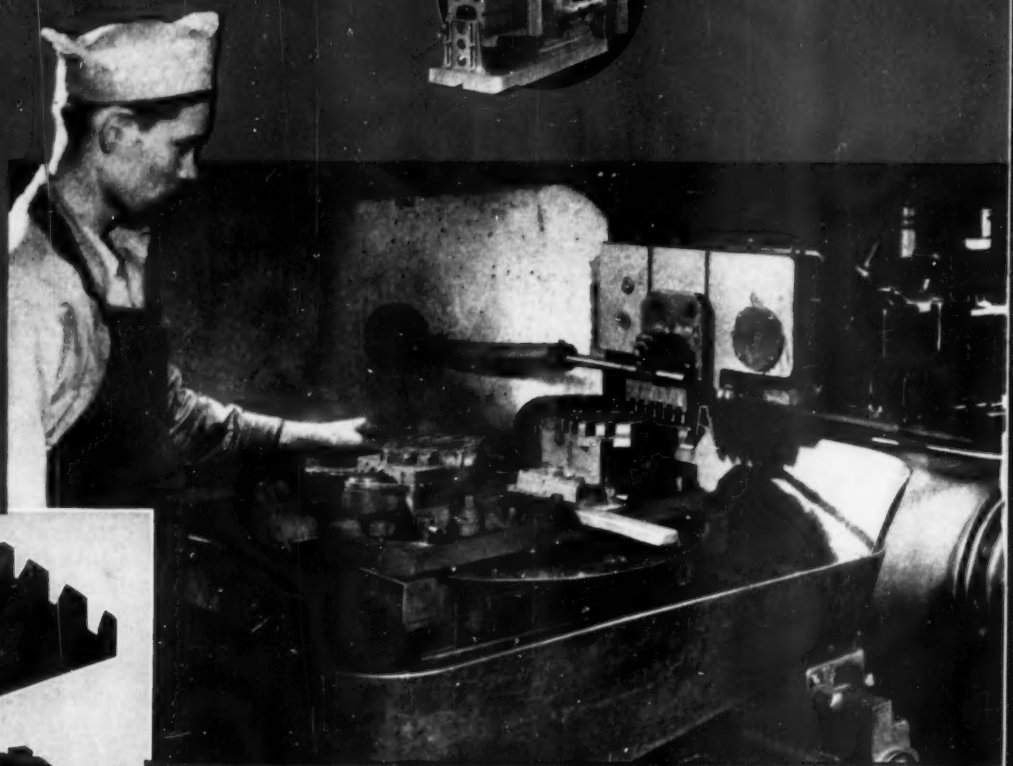
They are hunting bargains, not necessarily in price but certainly in the product's performance. If and when they are convinced that the product will benefit them sufficiently—in cost savings, in quality, in many other ways—you will get the order.

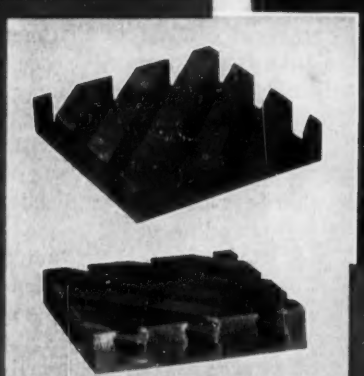
The main thing to do is to make sure that you have what the customer wants. If you have, and you then do a good job of selling him that fact, you can face 1954 without fear.

Burnham Finney

90 pieces per hour

...on this CINCINNATI SHAPER





Work piece is a malleable iron, Warnock diagonal block. Production, 90 per hour. Special designed gang tool holder carries six form ground high-speed tools.

Photograph courtesy Potential Machinery Corporation, Cleveland, Ohio.

This production job on a special Cincinnati Shaper is finished in one completely automatic cycle. Both initial cost and tooling costs are low.

The operator starts the Shaper; the head automatically feeds nine strokes to the right, nine to the left and stops. The operator indexes the fixture and the cycle repeats. Loading and unloading is done without interruption to cutting.

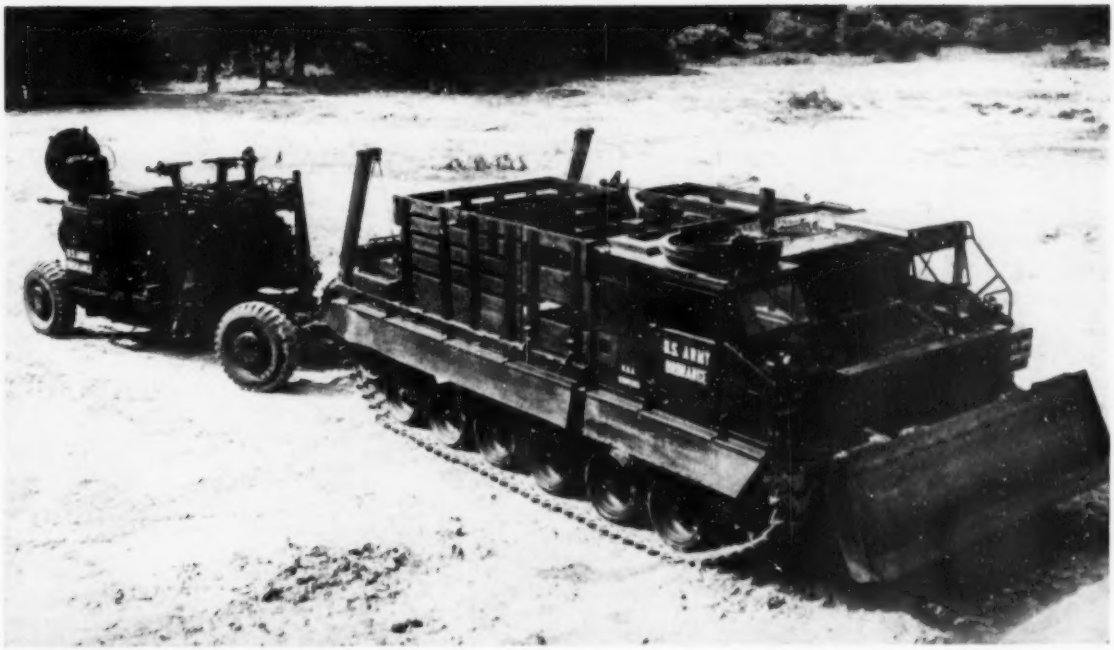
Consult us on your shaping jobs. A special Shaper may be very profitable to you.

Write for Shaper Catalog N-6.

CINCINNATI

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES



ARTILLERY'S NEW WORKHORSE, the M8E2 Cargo Tractor, can carry or pull heavy loads, and can bulldoze its way through difficult terrain. Split-torque drive and variable steering mechanism permit it to turn in its own length. Two men ride in enclosed cabs

SPECIAL FIXTURES SPEED ARMY TRACTOR HULL WELDING

BY H W LINDSAY, Works Mgr, LAPORTE WORKS, TRACTOR DIV, ALLIS-CHALMERS MFG CO

More than 1300 ft of weld are needed to make the hull of Army's M8E2 cargo-carrying prime mover, used to move personnel, ammunition or artillery at high speeds on highways or across rough terrain

DEVELOPED by the Ordnance Corps and Allis-Chalmers Mfg Co, an all-purpose workhorse, the M8E2 tracklaying Cargo Tractor will carry or pull heavy loads over all kinds of ground. It can be equipped with a bulldozer blade, or with a power loader for lifting heavy loads to its open cargo platform. In addition, its platform is large enough for mounting the auxiliary equipment required for the operation of antiaircraft guns, such as the recently publicized "Skysweeper."

Powered with a 500-hp aircooled supercharged engine, the vehicle can climb slopes as steep as 30° and can be operated in swampy as well as in mountainous areas. It can cross small unbridged trenches or streams.

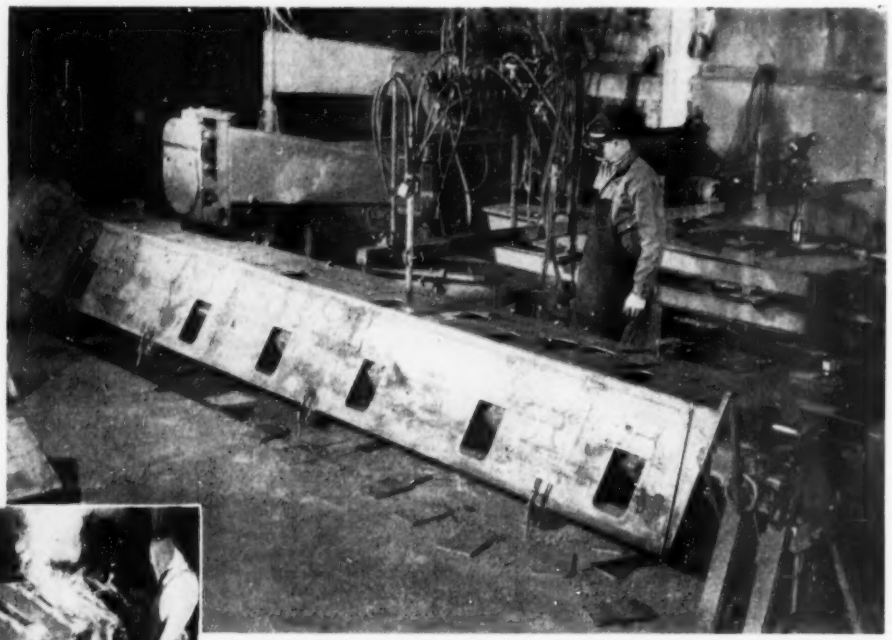
Largest unit part of the vehicle is the all-welded hull, made up of 510 individual mild-steel pieces. Nearly 120 man hours of welding time are needed to complete the hull assembly, despite the use of specially designed welding fixtures and high-speed welding procedures. When finished, ready for assembly into a vehicle, the hull is 78 in. wide, 30 in. deep, and more than 255 in. long.

All welding is done manually, using ac transformer-type welding equipment and coated rods. The various operations require a total of 2495 in.

of tack welding and 13,117 in. of double-pass ⅜-in. fillet welds—a total of 15,612 in. for each hull. Most of this welding is performed in building up the five major subassemblies (two sides, two bottom plates, and one rear-end unit) from which the hull is finally assembled.

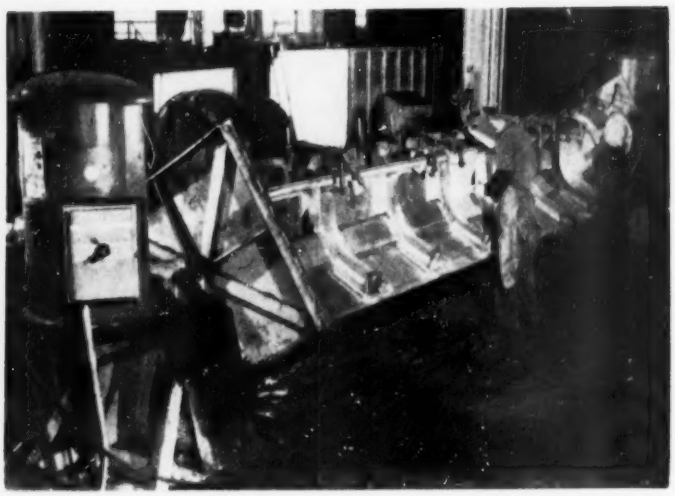
An important consideration in developing the welding fixtures, and in minimizing machining operations on the hull itself, is the use of pre-machined pads and mounting plates. This means that these items must be located and held within 1/64 in. of correct position when welding them into the hull subassemblies.

Most hull parts are made from hot-rolled FS 1020 (specifications also permit optional use of SAE 1010 or SAE 1020) steel and are press formed and/or flame cut to shape before delivery to the welding department. Principal operations on the hull are shown in accompanying illustrations.

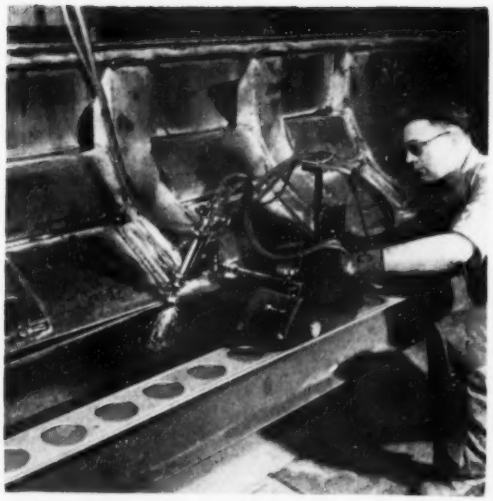


SIDE PLATES, formed in a 340-ton Cincinnati press brake, go to Airco magnetic-tracer-controlled flame cutter, where 18 openings are cut and one end is cut off at an angle. Two setups are required for each

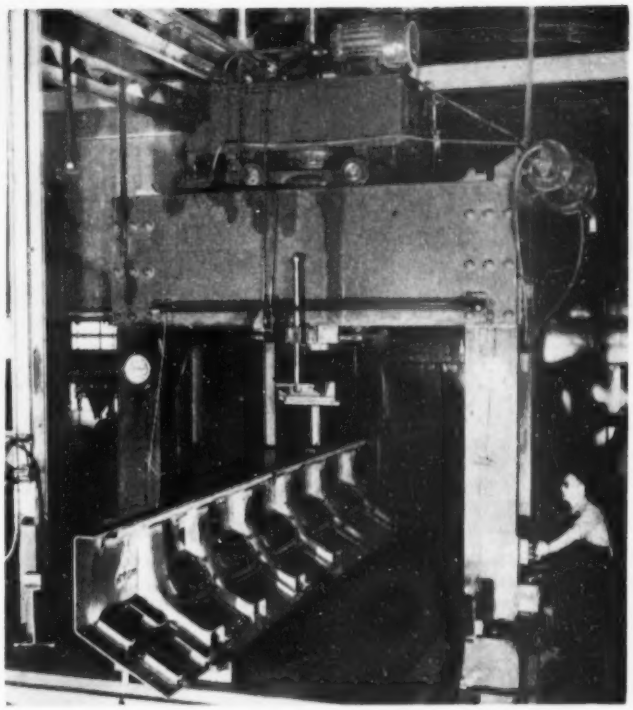
EIGHT PADS, six bosses and six flame-cut bogie shaft opening reinforcements are located and tackwelded onto each side plate, using a special fixture. Hinged clamps align and hold parts for tacking



SIDE PLATES are supported in trunnion fixture for welding pads, plates, and bosses previously tacked. Then plate is turned over for assembling and welding seven vertical and six horizontal press-formed ribs, and a number of support blocks. Two Model 500 Smithway welders are used so two operators can work at same time. Pushbuttons control Ransome positioner

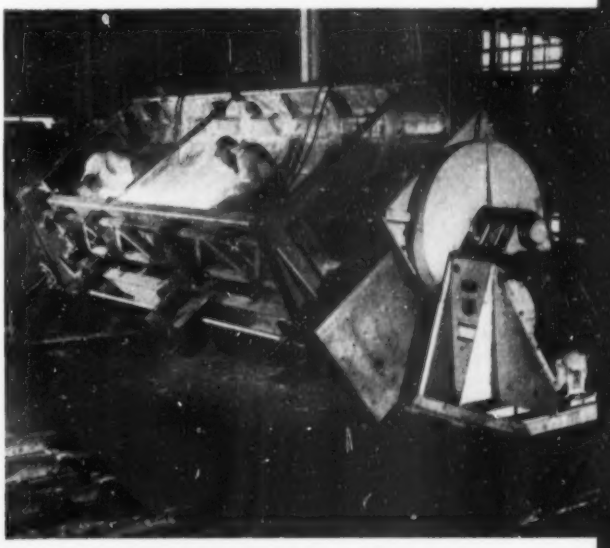


BOTTOM EDGE of completed side-plate subassembly is flame trimmed so all side plates will match bottom plates in final-assembly fixture. Brant "Cut-A-Line" cutting head travels along 20-ft track in front of fixture. Six target buttons in rear check straightness of subassembly

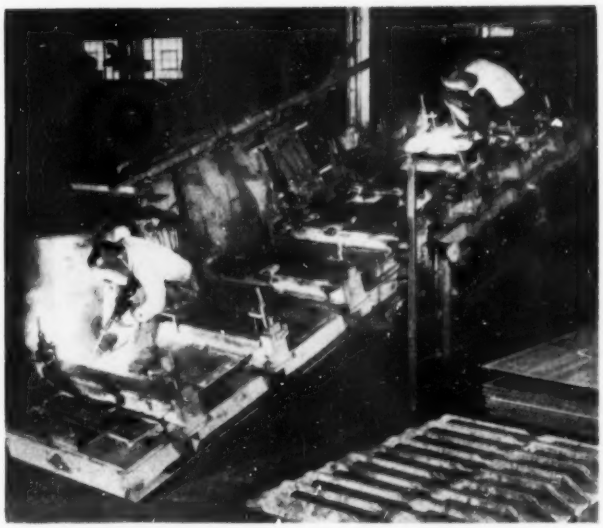


LAKE ERIE 400-ton hydraulic walking beam straightening press has 8 x 17-ft table so all hull subassemblies, or even a completed hull, can be straightened at any position if necessary. Overhead monorail hoists can move parts to this press from any part of welding shop

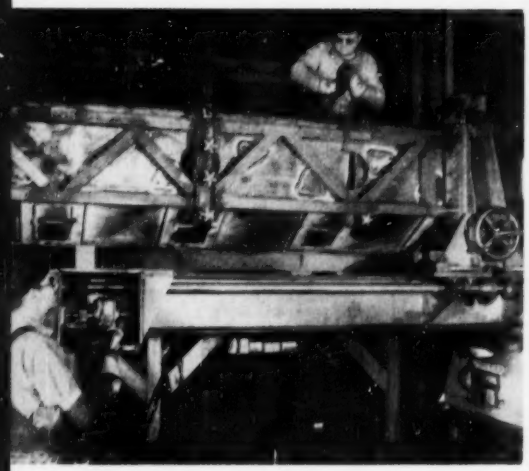
Welding operations play a major part and are all arranged for downhand work for maximum speed and convenience



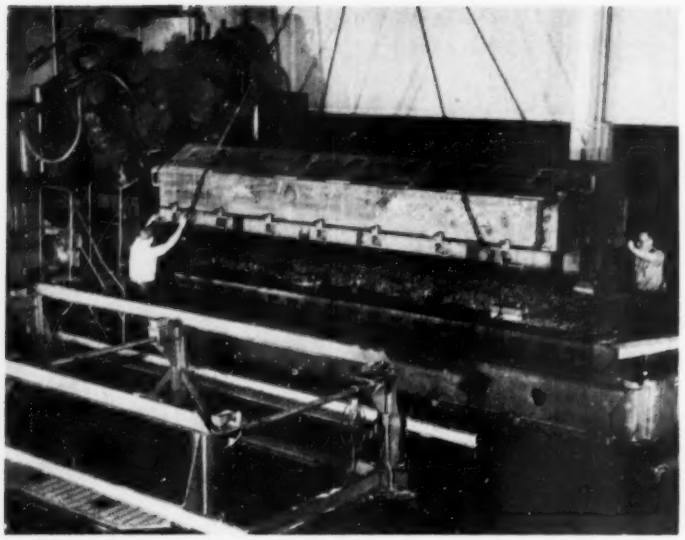
SPECIAL BUNELL FIXTURE, supported on 10,000-lb capacity Ransome positioner and outboard pedestal bearing, positions two bottom, two side and one end plate subassemblies to form hull. Fixture is power tilted so all welds can be made downhand. Two 625-amp Miller ac transformer-type welders are mounted on rack beside fixture



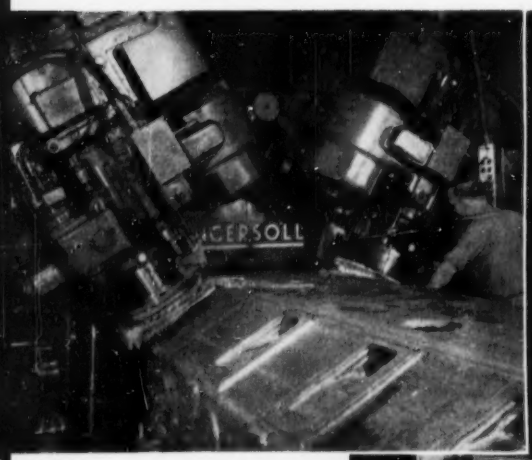
SPECIAL LINK FIXTURE on faceplate of 3000-lb capacity Ransome positioner is used for welding seven channel ribs to two hull bottom plates. Fixture is tilted both ways so fillet welds along each side of ribs can all be made downhand. Gages locate plates and ribs



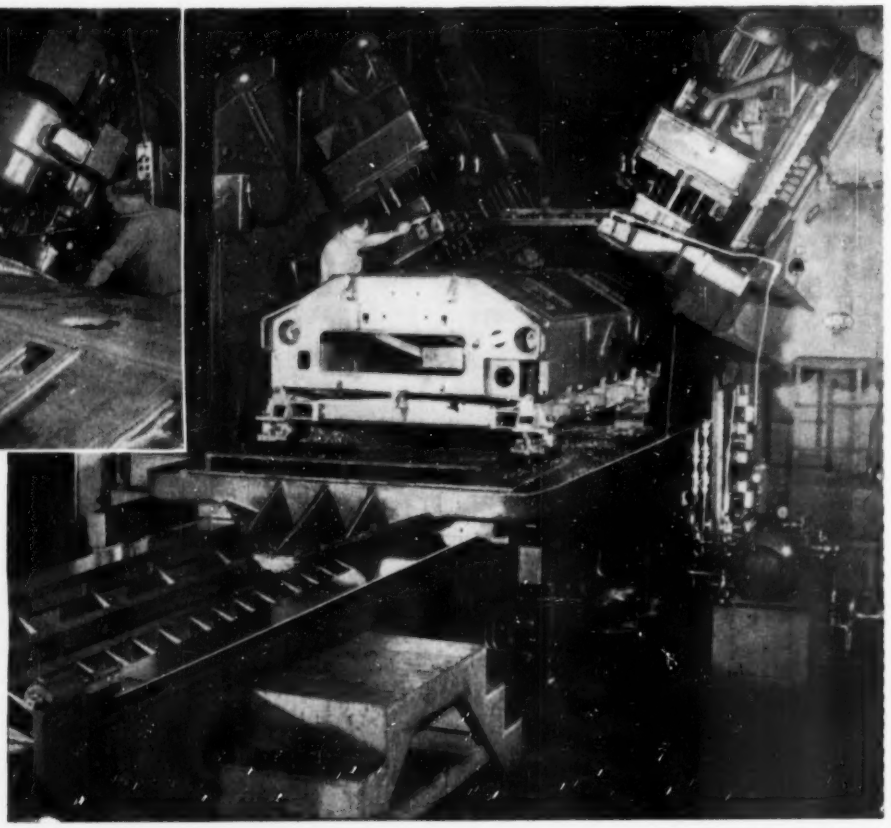
SIDES OF HULL assembly fixture are adjustable to position side plate subassemblies in line with bottom plate subassemblies prior to welding. Impact wrench moves fixture side slides through gear reducer and rack-and-pinion under each slide so side members are kept in line



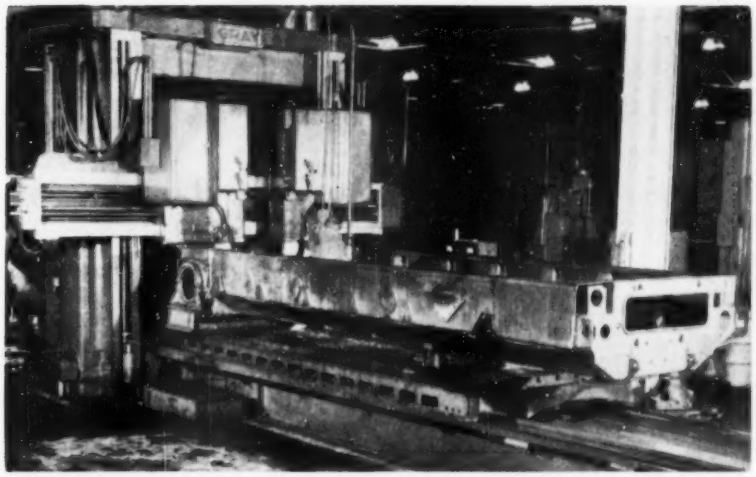
AUXILIARY FIXTURES speed milling and drilling of bogie support pads on sloped bottom faces of hull by minimizing machine setup time. Hull is positioned on fixture on rack in left foreground while other hulls are being machined. Fixtures are interchanged quickly, as pins position them on machine tables and rack



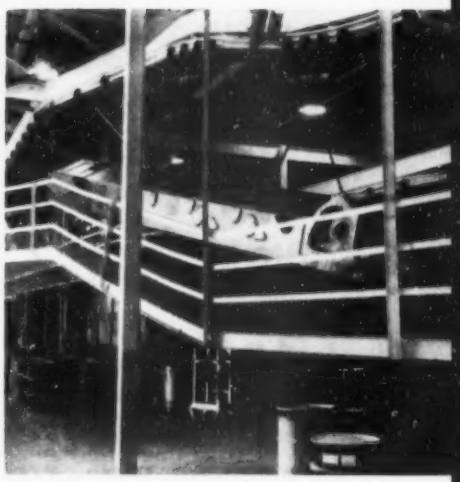
TWO HSS FACEMILLS, 22½-in. in dia, rough and finish faces of bogie pads in two passes of special Ingersoll miller. Each cutter is driven by 25-hp spindle at 10 rpm (3½-ipm feed) for roughing, and at 19 rpm (19-ipm feed) for finishing. Soluble oil is used



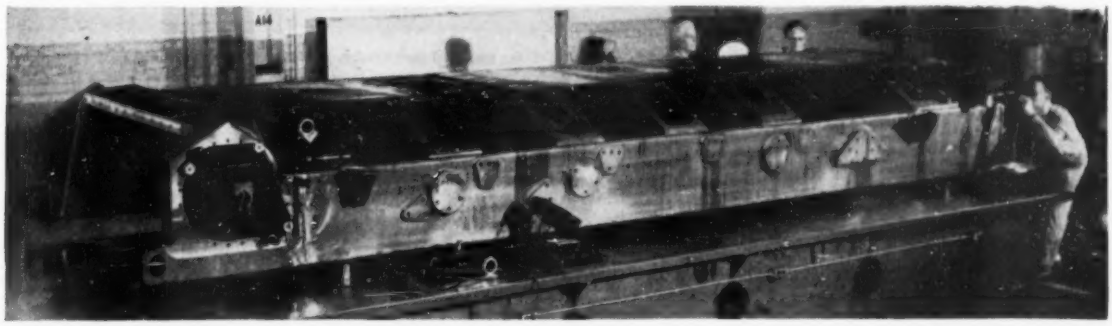
STILL ON LOCATING FIXTURE, hull is moved to special Natco four-head machine for drilling, counterboring, reaming and tapping holes in the seven bogie support pads along each side. Hull is removed and empty fixture goes back to Ingersoll mill for reloading, while milled hull is moved to Natco machine



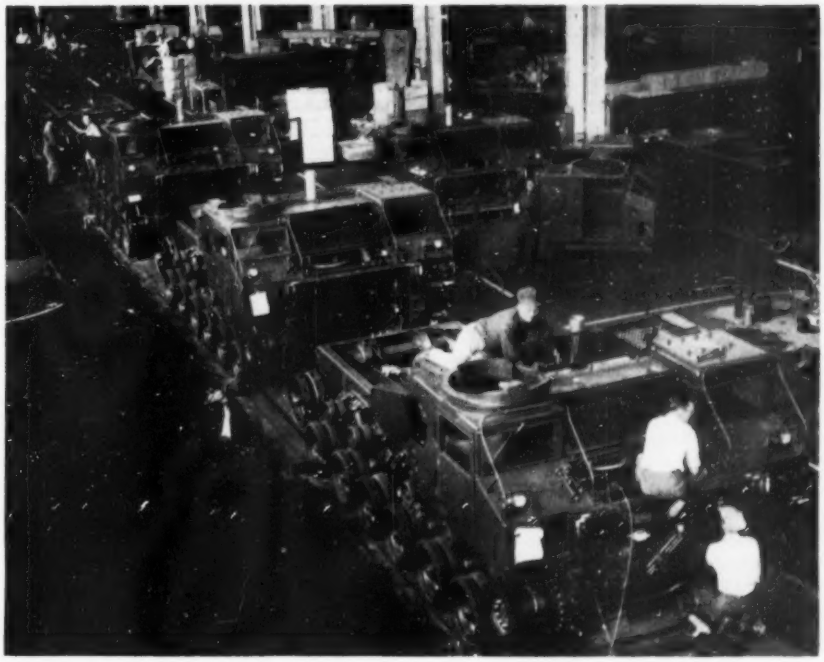
TWO 8-IN.-DIA FACE MILLS with two K2S Kennametal roughing blades and two K2S finishing blades rough and finish surfaces of six power-package mounting pads inside forward end of hull in one pass. Spindles in each of two heads of Gray planer-type miller have long travel to permit clearing top of hull when moved into position



OVERHEAD CHAIN CONVEYOR, 1500 ft long, carries finished hulls and other parts through cleaning and phosphatizing, and spray painting booths for finishing prior to delivery to assembly



FINAL INSPECTION is performed on 10 x 20-ft surface plate, using Zeiss optical collimator and illuminated targets supported from special brackets to check position and alignment of pads and other surfaces. Longitudinal and transverse checks are made with this instrument, eliminating any need for accurate leveling of hull

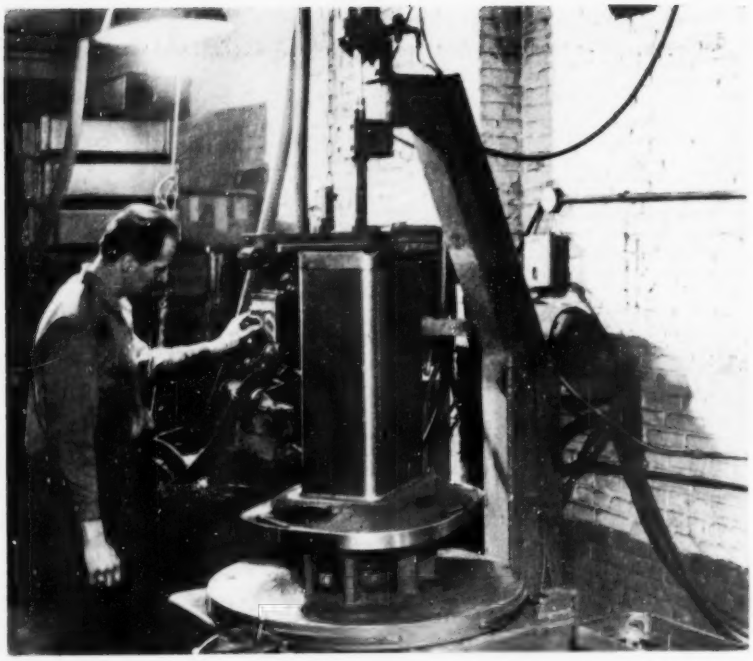


FINAL ASSEMBLY is on 14-station drag-chain conveyor line. Operations at each station are balanced carefully so moves can be made at predetermined intervals. Hulls ride on bogie wheels, mounted at start of line, until tracks are mounted at final station. Each completed tractor goes to a test track for thorough testing of its performance

machine welds powder cans at 100 ipm

Automatic setup fastens head and bottom to body with 3-O'clock welds at high speed. Weld quality is superior and hand work is eliminated

BY E A HESS,
Welding Engineer,
LINCOLN ELECTRIC CO



PECK AUTOMATIC MACHINE welds head and bottom to body of powder can. Cams on edge of rotating table actuate switch and cause the welding head to move radially when welding rounded corners

Fabrication of oblong powder cans for ordnance applications is a highly competitive business and requires efficient procedures to maintain economy if a profit is to result. Harrison Sheet Steel Co, Chicago, Ill, controls cost on cans it manufactures by minimizing hand welding.

Finished cans measure about 24 in. in height and have a 12×18-in. horizontal section with rounded corners. Bodies are wrap-arounds made from 16-gage mild steel and are formed in a tangent bender that produces corners with a 1.55-in. radius. An overlap of about ½ in. is provided at the center of one narrow side to permit resistance seam welding after tack spot welding to hold the correct overlap and insure correct end-opening dimensions for proper fit over recessed head and bottom stampings. The latter must make close fits adjacent to offset shoulders to insure good arc-welded joints.

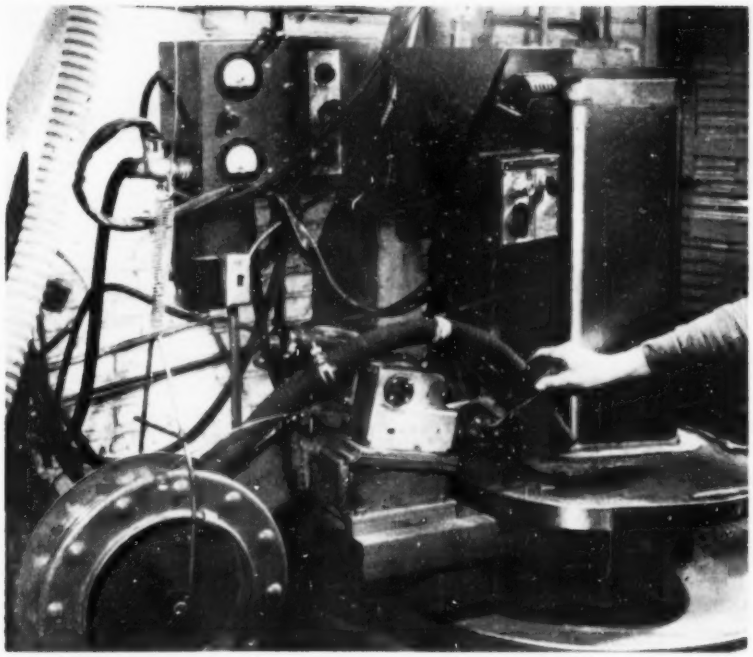
Head and bottom stampings are 13-gage steel and are identical, except that the top is pierced for a handhole and cover. A step or offset runs around the skirt of each stamping, and when the head and the bottom are pressed in place, the edges of the wrap-around come close to the step, leaving only a slight space or channel to be filled with weld metal. Head and bottom are pressed in by a hydraulic ram in a holding fixture, then are spot tacked with a gun welder to hold them in correct position for final fastening by continuous arc welding. The head and bottom recess inside the wrap-around. When assembled, the outer faces of the skirt, because of the offset step, are almost flush with the wrap-around. Welds are also nearly flush with adjacent surfaces. Before assembly, outer edges of skirts are curled in, except at corners, so handling can be done without sheared edges of the metal tending to cut hands.

Initially, it was planned to make the peripheral arc welds by hand for joining the head and bottom to the body. But the cost of hand welding, which is comparatively slow, proved to be prohibitive. Hence, Harrison employed the Cecil C Peck Co, Cleveland, to design and build a machine to make the arc welds automatically at high speed — 100 ipm. The resulting machine is completely automatic, save for loading and unloading, moving the levers of air locking and unlocking valves, and pressing the button that starts each weld.

All welding equipment is of standard make and includes an automatic Lincolnweld hidden-arc head and controls, and a 600-amp dc generator with a supplemental exciter. Actual welding current averages about 425 amp at 24 v. Filler wire is ⅛-in. mild steel, and No. 760 flux is employed.

Aside from the welding equipment itself, the machine includes a rotating table on which the can is supported and air clamped inside an oblong copper ring. This ring forms a ledge or shelf on which the flux feeds to submerge the arc.

As the can turns about a vertical axis with the table, the head, which supports the electrode at an angle of about 15° to the horizontal (approximately a three o'clock welding position) must be guided so it will, it effect, move



LINCOLNWELD HEAD and control equipment making a peripheral automatic arc weld to join bottom stamping to body of can as latter rotates on table of Peck machine

parallel to the flat faces of the can and also swing around the four corner radii.

Actually, the head is moved radially in and out on a slide by a roller cam and is also given a swinging motion when cams on the outer diameter of the table actuate a limit switch. This motion is such as to hold an arc of constant length and to provide a constant speed in forming the bead.

WELDING PROCEDURE

In making each pair of peripheral welds, the procedure is: Operator sets a can, bottom down, in the fixture and operates a valve which causes the air ram to descend and to lock the can on the table. When a start button is pressed, the flux begins to feed, then the electrode moves in to contact the can and to start the weld as table and can move around the vertical axis. Welding starts near the center of one side and continues automatically until the can has moved through a full revolution plus a slight overlap. The latter is made over a short space from which fused flux has been chipped by the operator. When the weld is complete the operator presses a stop button and moves an unclamp lever. This lifts the top clamp and simultaneously operates an ejector that elevates the can. Can is then inverted by hand to bring the top into the copper ring. The same cycle is repeated to complete the second weld.

Welds are made so rapidly that 31 or 32 cans, each having two peripheral welds, are handled through the machine each hour. With the high current applied to the small electrode, excellent penetration is obtained, and smooth, uniform, ductile welds result.

Because of the precise automatic control of the arc, welds are of high quality and are much better and faster in production than hand welds. Welds must be air tight, so all cans are tested under air pressure in water tanks. A high percentage of perfect welds is attained, but occasional flaws are easily hand-arc repaired. After welds are cleaned and checked, cans are sent to another shop for galvanizing inside and outside before undergoing final inspection.

Boeing-Developed Plastic Saves Die-Fabricating Time

BOEING AIRPLANE CO'S Seattle plant has developed a new plastic compound particularly valuable in construction of joggle dies.

Recently, two production dies were made from the plastic in 80 and 86 hr, compared with an average of 250 hr required to fabricate the same die from steel. The plastic is shaped by filing.

The plastic, dubbed "Dunnlew" by Boeing, after its inventor, will bond to metal, glass, wood, Fiberglas, and many other materials, without pressure or heat treatment.

The plastic has a base of epoxy resin, rather than the usual phenolic base. Where the phenols make a plastic harder and more brittle, epoxy makes it more flexible.

The liquid plastic hardens in about 8 hr, and reaches full strength in 48 hr at normal room temperatures (more rapidly at higher temperatures). It has a compression strength without yield of 36,000 psi, while shear strength from a simple contact bond is 3750 psi. Strength and hardness are retained at temperatures from below zero to above 100 F.

Besides making joggle dies, the plastic is now being used to set drill bushings, set templet headers, form apply-trim templets, and cast master gages. To change a Fiberglas drill jig to meet engineering changes, the old bushings are drilled out of the jig, leaving oversized holes. New bushings are placed on pins in the metal part, the drill jig is placed over it in the required position, and plastic is poured around each bushing. As soon as the plastic hardens, the drill jig, including the bushing, may be lifted out, and is ready for use.

As yet, Boeing does not know whether it will market the compound.

Cope Talks on Draw Dies ... VI

When You Redraw Shells Observe Certain Rules

Tools for redrawing round shells are comparatively simple, but you must choose the right kind of stripper or knockout, and apply the correct angle to die ring and collar

BY STANLEY R COPE, President ACME SCHOOL OF DIE DESIGN ENGINEERING

Redrawing dies may be divided into three general classes:

1. Single - action push - through dies
2. Inverted draw-collar dies for single-action presses
3. Double-action dies

Push-through dies are used to reduce small-diameter shells drawn from thin stock, or larger shells that do not exceed 3½ in. dia and are drawn from 1/16 in. or heavier stock. The stock must be thick enough to resist wrinkling and buckling during redrawing.

There are two general types of push-through dies: those that draw the shell straight off and dispose of it by pushing it through the die, and those that leave a flange around the open end of the shell and eject the shell by a knockout. The first type is made in three styles, depending upon the diameter and length of the shell and the wall thickness.

Small shells that do not exceed 1 in. dia should be reduced in dies like that shown in Fig. 1. Shell *A* is located in gage ring *B* and rests on drawing die *C*. When punch *D* descends it enters the shell and forces it through the die. As the shell emerges from the bottom of drawing die *C*, *it forces* the segments of stripper *E* outward. When the shell has passed through the die and the stripper, the segments are returned to their normal position by coil spring *F*.

When the slide ascends, the shell is stripped from the drawing punch by the segments. These should be made from hardened and ground tool steel. The counterbored hole in which they are retained must be a few thousandths deeper than the height of the segments to permit them to move freely.

The die shown in Fig. 2 is used to reduce shells that have comparatively thick walls and are not more than 5 in. dia, nor more than 6 in. deep. The die is constructed and operated in the same manner as the die described in Fig. 1, with the exception of the stripper. The shell is stripped from the punch by two or three spring-actuated strippers *A*. The strippers slide in slots machined in holder *B*. They are normally held inward by pins *C* and springs *D*. The strippers should be tapered at the top. They are made rather sharp on the lower edges, which come in contact with the work. The strippers should not be allowed to touch and scratch the punch.

The die shown in Fig. 3 is equipped with a stripper for large-diameter thin-walled shells. A typical application would be to reduce the shell to a diameter of 5 in. and a length of 10 in. Gripping action of jaws *A* is similar to that of a collet. Pressure is applied to the jaws in a direction parallel to the path of the shell by pins *B* and springs *C*. As the shell passes through the redrawing die it strikes the jaws and forces them downward and outward. When the shell has passed through the stripper the jaws close inward over the end of the shell and prevent the shell from rising with the punch.

When it necessary to leave a flange on a shell, the work is ejected from the die by a pressure attachment or pull-up attachment. It is stripped from the punch by either a positive knockout or a riding stripper, as shown in Figs. 4 and 5. The choice of stripper depends upon the diameter and the length of the shell and the stroke of the press. A press with a longer stroke than that required for a riding stripper is necessary when a positive stripper is used.

Stepped shells can be produced by pushing a plain shell part way into the die, as shown in Fig. 6. The drawing angle of the die should be 60°, measured from the horizontal, and the shell should have large radii at the shoulders to prevent the large portion from collapsing during the redrawing operation. The shell is completed in a die similar to that shown in Fig. 7.

COLLAR DIES FOR SINGLE-ACTION PRESSES

Shells with thin side walls, or shells of large diameters, must be supported inside during redrawing to prevent wrinkling or buckling.

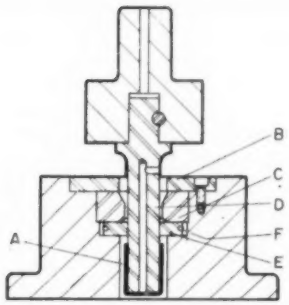


Fig. 1

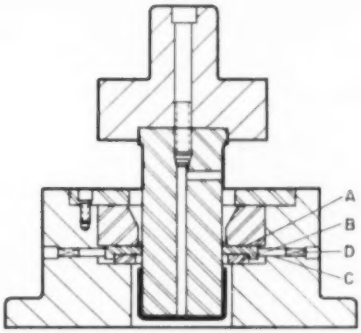


Fig. 2

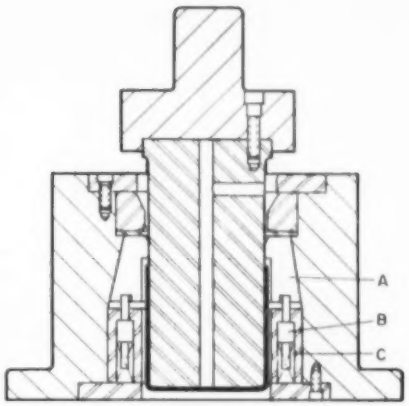


Fig. 3

WHEN SHELLS are drawn straight off in redrawing dies, the design of stripper depends on shell diameter and wall thickness: **Fig. 1** . . . For small shells, the stripper consists of segments held by a coil spring; **Fig. 2** . . . Thick-walled shells need stronger spring-backed strippers; and **Fig. 3** . . . Large, thin-walled shells are stripped from the punch by collet-like jaws

This is accomplished in single-action presses by inverting the shell and placing it over a collar or a draw ring in a die similar to that shown in Fig. 8. Collar *A* is normally held flush with the top of drawing punch *B* by pressure pins *C*. In addition to preventing the shell from wrinkling or buckling, the collar serves to locate the shell and to strip it.

When die ring *D* descends, it grips the bottom of the shell, forces the collar downward, and causes the metal in the shell to flow between the angular surface of the die ring and the collar into a shell of smaller diameter. When the upper die ascends, collar *A* strips the shell from punch *B*, and the work is carried up into die ring *D*. It is stripped from that member by knockout plate *E* and knockout rod *F*.

To reduce the surface that bears against the shell, the clearance hole in the punch holder is machined 0.010 or 0.020 in. larger in diameter than the hole in the die ring. The top portion of the knockout plate is machined for a distance of 3/16 in., so as to slide freely in this hole. This shoulder is used only to guide the plate, and not to retain it. The hole in the punch holder must be smooth and only slightly larger than the hole in the die. If the hole is rough or too large, shells which become broken will catch on the top of

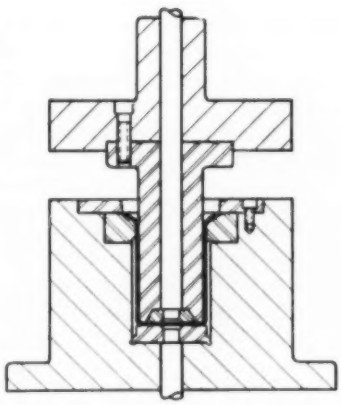


Fig. 4

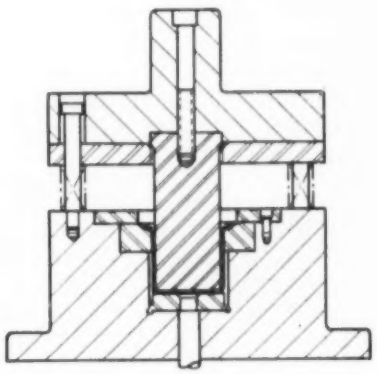


Fig. 5

FIG. 4 . . . A positive knockout through the punch will strip a flanged shell. **Fig. 5** . . . An alternate stripping method is the use of a riding stripper

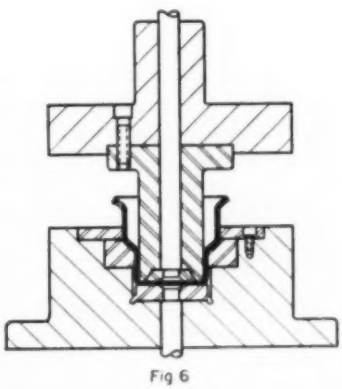


Fig. 6

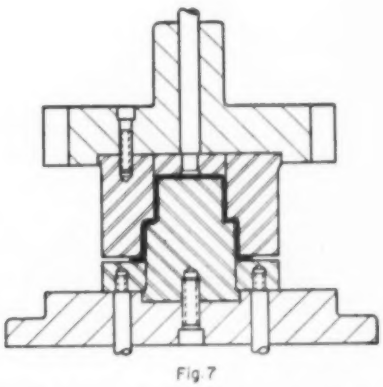


Fig. 7

FIG. 6 . . . A flanged shell is redrawn to a stepped shell in a die fitted with two knockouts. **Fig. 7** . . . Step and flange are "set" in this tool, the die member being fitted with a knockout, and the punch with a stripper

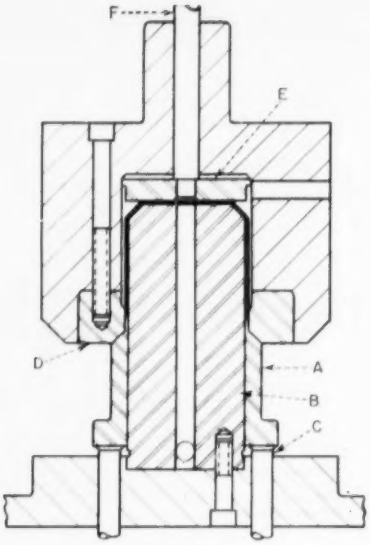


Fig. 8

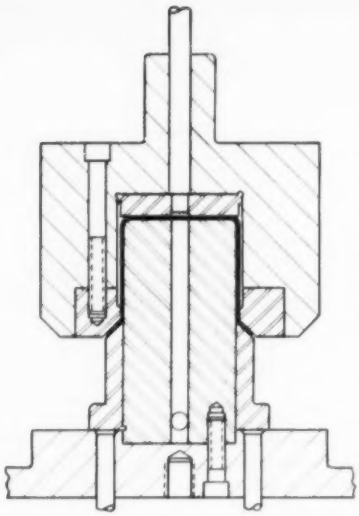


Fig. 9

FIG. 8 . . . Support for thin-wall shells is provided by inverting the piece and placing it on a collar *A*. Fig. 9 . . . By controlling the redrawing depth, the flange may be left on a shell, or the shell may be reduced part way

the die ring and will be difficult or impossible to eject. Collar *A*, punch *B*, and die ring *D* are made of tool steel and are hardened and ground. Only a small portion near the top and bottom of the hole in the collar is allowed to bear against the drawing punch.

Flanges may be left on shells drawn in collar-type reducing dies (Fig. 9) or the shell may be drawn only part way by laying out the die so that the shells can only enter a certain distance. The knockout plate is allowed to bottom in both dies, so that all shells will be redrawn to the same depth. It is also advisable to bottom the drawing collar when shells are drawn only part way.

DOUBLE-ACTION REDRAWING DIES

Four types of double-action dies are used for redrawing small shells. In Fig. 10, the shell is located in nest *A* and rests on die ring *B*. When the blankholder slide descends, drawing collar *C* slips into the shell and presses the bottom of the shell against the angular drawing edge of the die ring. Punch *D* then draws the shell off the collar and causes it to assume a smaller diameter and greater length by forcing it through die ring *B*. When punch *D* returns to top stroke, the shell is prevented from rising by strippers *E*. The die is shown in three positions to illustrate how shells are redrawn in double-action dies.

When a shell has a flange, or when it is not advisable to push it clear through the die, the shell may be ejected by a knockout located in the bed of the press. A hole is cored through the die holder to clear the shell, and a small plate is fastened to the knockout rod.

When it is necessary to stamp a depression in the bottom of the shell, the drawing punch and the knockout plate must be machined to conform with the shell.

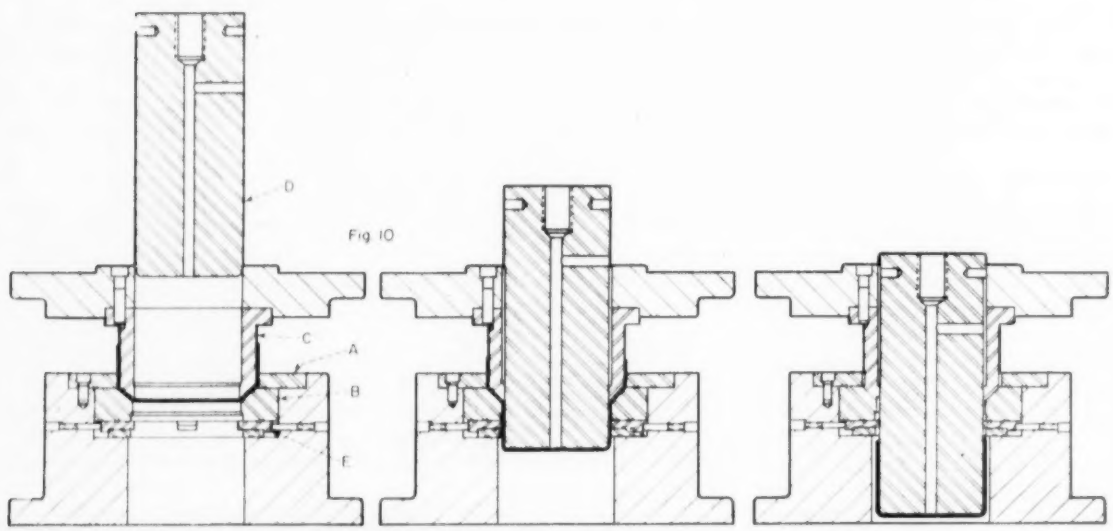


Fig. 10

FIG. 10 . . . In a double-action redrawing die, drawing collar *C* is operated by the blank-holder slide, and the punch *D* by the inner slide. Dies of this type are chiefly used, to redraw large shells

DESIGN PRECAUTIONS

There are three things in the design of all redrawing dies which are of utmost importance. These are:

1. Clearance between punch and die
2. Shape of drawing edge
3. Length of the straight portion, or bearing surface, in die ring.

The clearance to allow between the punch and the die has been discussed previously (*AM*—Aug 31 '53, p96). The shape of the drawing edges for push-through-type dies should be as shown in Fig. 11. The die is machined to an angle of 60° measured from the horizontal. The upper part of the die has a seat, or nest, for locating the shell to be redrawn.

As will be seen in the illustration, the angular drawing surface is joined to the outer seat, or nest, and inner drawing surface of the die by rounded corners. The radii of these corners is generally made small—often ⅛ in. or less.

For double-action dies, or for draw-collar type dies to be used in single-action presses, the angles (measured from the horizontal) should be as follows: for redrawing stock up to 1/32 in. thick, 30°; for stock ranging from 1/32 to 1/16 in. thick, 40°; for stock over 1/16 in. thick, 45°. See Fig. 12. These are the same figures that were given (*AM*—Sept 28 '53 p128) for laying out the angular corners of preliminary shells. The angles on the die and pressure pad must be the same as the corresponding angles on the shell.

The length *X* of the die ring is made about ⅜ or ½ in., depending upon the size of the die. If this surface is too long, it may increase the frictional resistance between the die and the shell to such an extent that excessive stretching and straining of the metal occurs. Moreover, the pressure exerted on the metal when it is being drawn over the rounded edge removes most of the lubrication, leaving very little of it for the straight surface. Consequently, if the cylindrical part of the die is overly long the shell is likely to become scored.

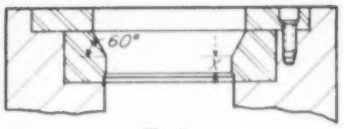


Fig 11

FIG. 11 . . . Push-through dies should have a 60° throat on the die ring

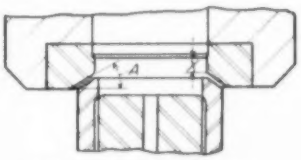


Fig. 12

FIG. 12 . . . Angle on face of collar and die ring of collar-type and double-action redrawing dies varies with the shell thickness

Part VII of Mr. Cope's series will appear in an early number.

Tips

FOR TOP SHOP MEN

470 Orders shouldn't be necessary most of the time. If you have to "boss" people all the time, you need help, either in the form of assistants or in your way of handling the job. Informal suggestions should work most of the time.

471 Faith, hope, and charity—these three are vital in management, too. Have faith in your men, hope with them and for them, and be charitable when they make a justified mistake.

472 You may know more than any salesman who calls, but give yourself a chance to prove it. And prove it to yourself, not to him. Hear him out—in the welter of words, there may be some that will give you an idea. Remember that a miner washes a lot of gravel to get a little gold.

473 Don't use your Sunday punch on Friday. Always have a little more in reserve—be it power, capacity, morale, or just plain guts. Save it until you can't win without it, as the good military commander waits to commit his reserve.

474 The idea that was crazy when you went to school may be practical now, and the method your grandfather used may turn out the best again. Times change, and so do materials, methods, and ideas. High-rake milling was done 50 years ago—and forgotten—but is working very well again.

475 Day by day, it is wise to manage by exception—to throw your weight in on the part of the job that needs it. But, every so often, it's advisable to test your weight against the part that's going well, to see if it can be made to go better.

THE DRAFTSMAN

They gave me a job to draw today, with a hole and a couple of grooves,
It's only a cleat that goes under a door, to restrain it whenever it moves.
I could sketch it up with a couple of lines, and put on a size or two,
But that wouldn't show how much I know, so I'm sure that it never would do.

So I'll cut it all up into sections, with a symbol beside every part,
And I want to be sure that I make it obscure, as to where the machining will start.
Then it's time to put on the dimensions, and thats when I really unload,
For I'll mark all the lines with mysterious signs, that an Einstein could never decode.

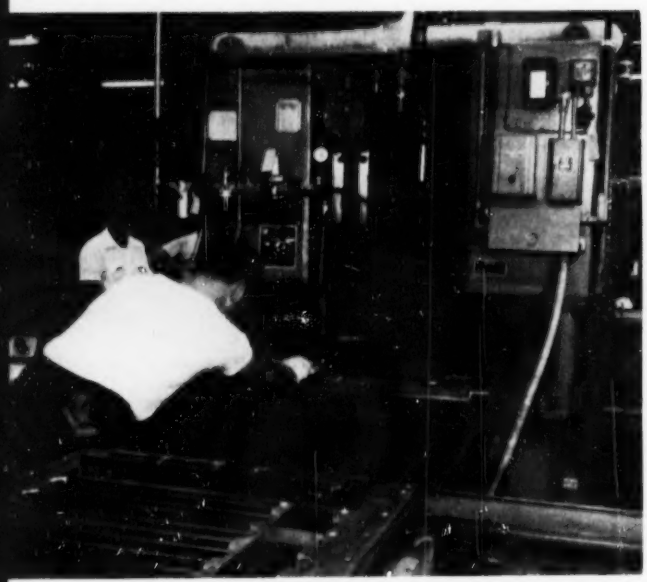
Now my drawing is finished and printed, and I'm proud of its hazy design,
For I know there'll be chaos and ulcers, when it finally comes out on the line.
And a feeling of pride starts astirring inside, as my tracing is filed on the shelf,
For my quest has been solved with a print so involved that I can't even read it myself!

—Samuel F Perkins Jr

CONDENSING UNIT is assembled to pump and mounting frame on slat conveyor carrying formed wood blocks to locate and support bottom units. Conveyor moves continuously toward loading station of 7,000-ft overhead chain conveyor serving cooling-unit dept

Refrigerators move faster on...

Tooled to make a domestic refrigerator every 40 sec, new 1,000,000-sq ft plant is integrated with adjacent electric range plant for economical shipment of mixed carloads.

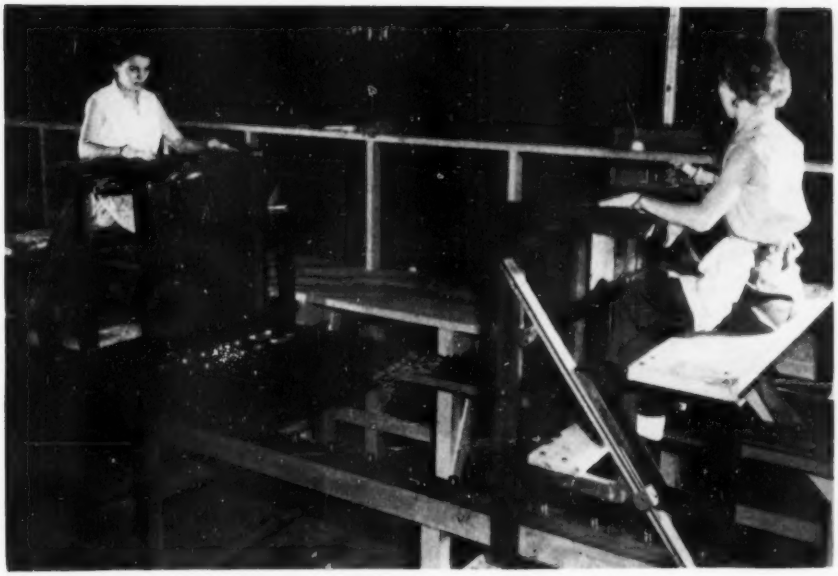


PRESS-TYPE AUTOMATIC WELDER makes 2600 welds in 13 to 15 sec to join 1/16-in.-dia steel radiating wires to copper tube of cooling-unit condensers. Assembly is built up in fixture that moves around square track connecting assembly position with welder

Designed to make tomorrow's domestic refrigerators better and at less cost, Hotpoint's new refrigerator plant is equipped with the latest production, assembly, and testing machines. Better than 98% of the equipment is new, and much of it is especially designed. Particular attention has been given to in-process and final testing—each refrigerator is tested 14 times before shipping.

Occupying approx 1,000,000 sq ft of floorspace, the plant, when operating at capacity, will consume 60 million lb of steel, 2 million lb of aluminum and 428,000 lb of copper and stainless steel annually. Warehouse capacity is provided for storing 25,000 electric ranges and 40,000 refrigerators, and both appliances can be shipped in full or mixed carloads. Up to 36 freight cars can be spotted along three tracks within the warehouse.

The plant is tooled to make nine different models of domestic refrigerators in four different sizes. Changeover is accomplished without change of hangers or carriers on any of the conveyors in the mechanized handling system which controls flow of parts and subassemblies through the various production lines feeding the final assembly conveyor. The several conveyor lines, if combined, would extend nearly ten miles. More than eight miles of overhead



OPERATORS SEATED above condenser-assembly track feed precut and straightened radiating wires to vertical magazines from which they are raked by comb on fixture as it moves along track. Between wire feed stations, copper tube is accurately positioned between formed locators.

10 MILES OF CONVEYORS

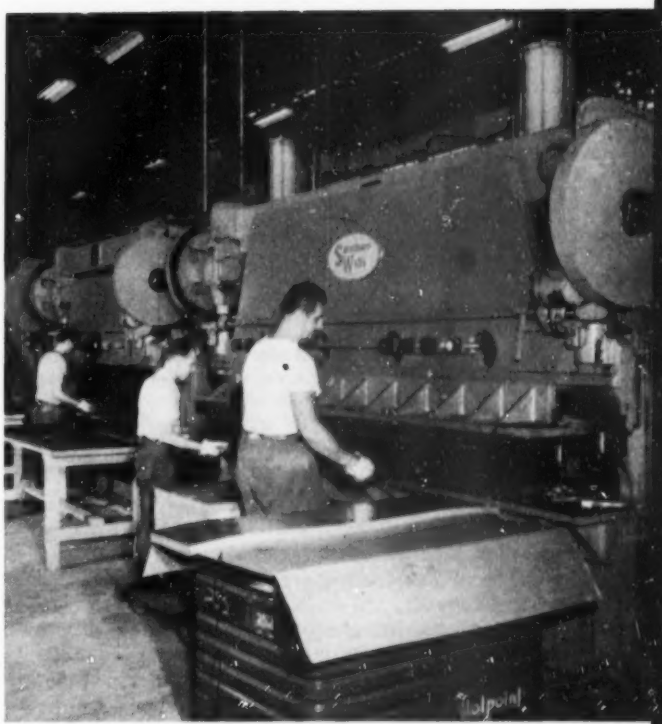
BY B E SCHROEDER, vice president mfg.
HOTPOINT CO

chain conveyor are installed to serve the various departments.

Manufacture of cooling units is entirely separate from production of sheet-metal cabinets. In the cooling-unit area, a 7,000-ft overhead chain conveyor traverses all component-part production sections to eliminate trucking subassemblies and major parts to the main assembly line. After picking up these components, the conveyor carries the units through assembly, inspection, dehydrating, evacuation, charging and testing stations, then delivers them to the refrigerator assembly line. All operations on the unit are performed while it is supported on a special carrier suspended from the chain conveyor. Only when a unit fails to pass one of the several tests is it removed from the conveyor at any point along the line.

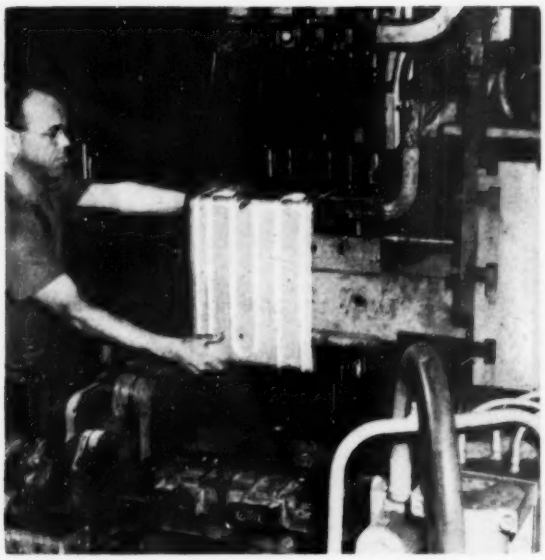
SPECIAL UNITS

A number of special production and testing units novel to the refrigerator industry are installed. These include a special assembly and welding unit for making condensers, developed for Hotpoint by National Electric Welding Machines Co, a Meeker automatic anodizing machine to finish the assembled evaporators, an unusual dehydration system made by Consolidated Vacuum Co that reduces moisture in

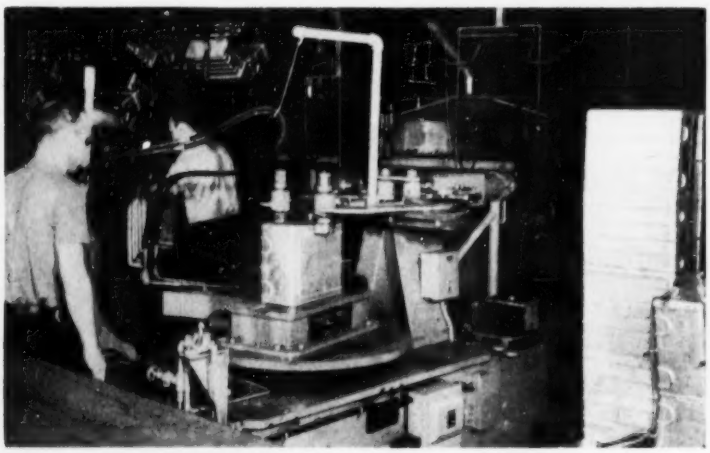


EVAPORATOR BACK PLATES are pierced, embossed, and flanged from pre-cut aluminum sheets in a series of operations on this line of three 150-ton Struthers-Wells press brakes. Operator of third press feeds parts to automatic washer

WORKING ALONG BENCH leading to brazing furnace, operators place aluminum tubing and brazing strips on back surface of cleaned evaporator plate. Grooved weights locate and hold tubes on the plate during brazing



EVAPORATOR IS FORMED in one operation from flat backplate and tube assembly in Struthers-Wells combination tangent bender and resistance welder. Cycle is automatic once parts have been positioned in the machine



EXPANDING AND CRIMPING MACHINE designed by Struthers-Wells for this operation simultaneously sizes the evaporator and locks the back plate in place. Automatic cycle insures high production rate

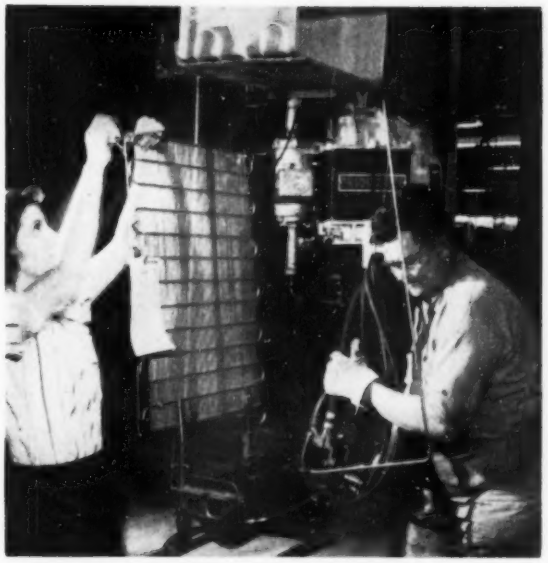
SPECIAL WELDERS using advanced argon gas techniques were designed and built by Hotpoint for automatically joining aluminum headers and copper-aluminum connectors to the evaporator. Units then are placed on a conveyor for leak testing and anodizing

the unit to about 50% of that left by other systems and evacuates them to about 20 microns, and special automatic oil and freon chargers made by Acme Aluminum Alloys Co.

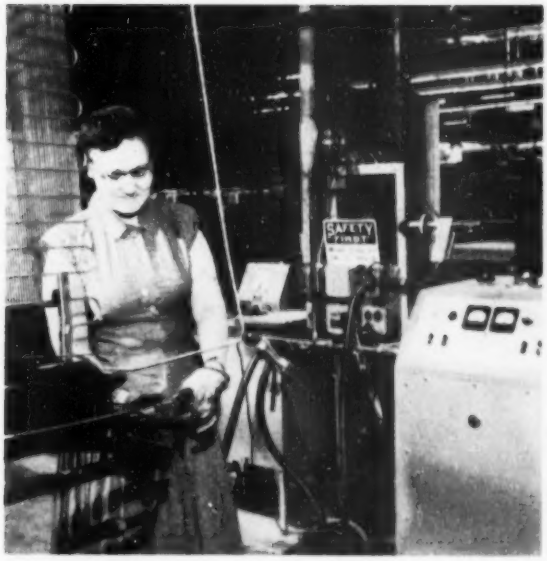
Of special interest is the method of leak detection. After dehydration, units are conveyed to a hood under which there is a low concentration of helium. If a unit leaks, helium gas is sucked into it by the high vacuum produced by the dehydration unit. As they leave the hood, units cool to room temperature. Then a mass spectrometer is connected to each unit, so leaks, so small that it would take 200 years for an ounce of refrigerant to leak out, can be detected.

CABINET PRODUCTION

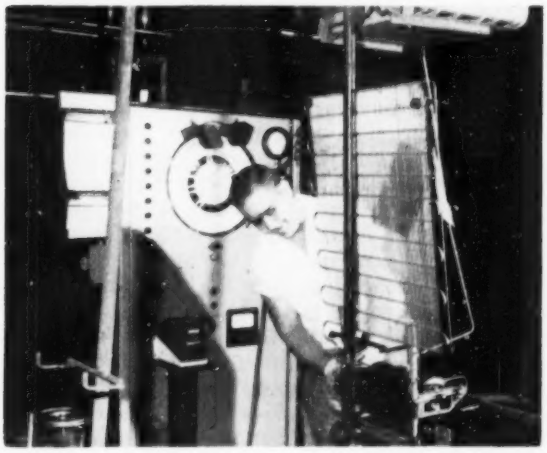
Sheet-metal cabinet parts are fabricated and finished in a separate building and delivered to the refrigerator assembly lines by overhead conveyors that travel across a city street through two covered bridges. Four separate press lines produce cabinets, doors, liners, and miscellaneous parts. Parts are moved manually from press to press along each line, then conveyors take liners and vegetable pans to the adjacent vitreous enameling department, and an-



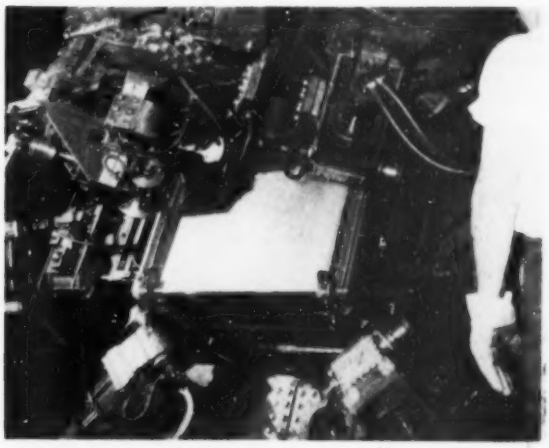
EVAPORATORS ARE JOINED to the condenser and pump subassemblies on the cooling unit conveyor. At this station, girl is grommeting the condenser, while welder mounts a bypass tube that prevents damage to compressor during test operations



MASS SPECTROMETER provides accurate test for minute leaks in cooling unit, after dehydrated unit under high vacuum has been carried through hood holding low concentration of helium. A leak would suck helium into unit, and this would be discovered here



AUTOMATIC UNIT made by Acme Aluminum Alloys Co injects properly proportioned quantities of freon and oil into cooling unit. Arms on scale show load requirements for different models. Conveyor takes units to dip tanks for painting after charging



SIX-WHEEL NATIONAL resistance welder simultaneously joins ends to liner body formed in adjacent tangent-bender. Cycle is automatic. Completed liners pass through Goodrich automatic spray pickling machine for cleaning before delivery to enameling dept

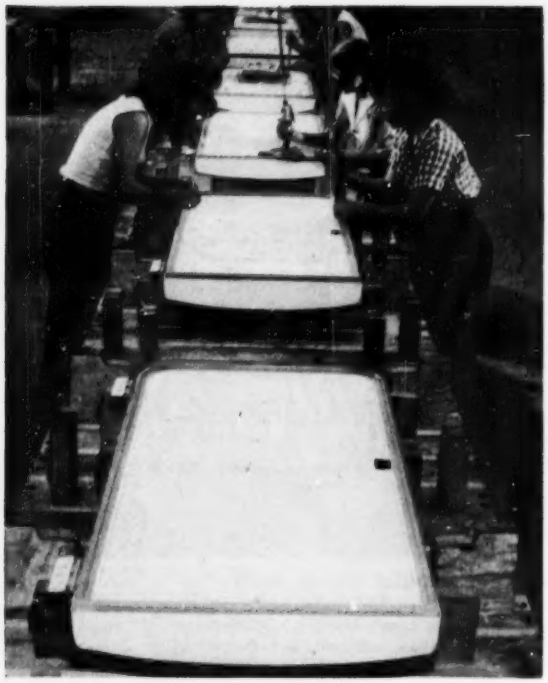
other conveyor delivers doors and cabinets to a paint dep't.

Porcelain-enameled liners and pans move from the enameling department to the refrigerator assembly line on special hangers suspended from an overhead chain conveyor. A storage conveyor parallels this, so liners and pans can be finished even if the refrigerator assembly line is not operating. This makes it posible for the enameling department to operate on an "odd shift" basis, or to finish and store liners for one size of refrigerator while units of another size are being assembled.

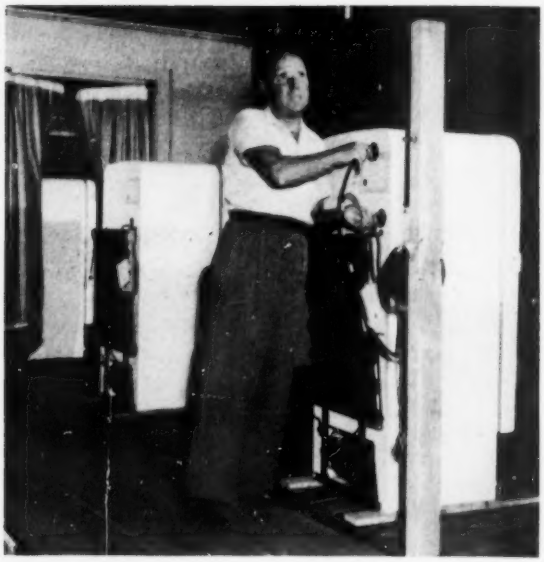
Doors and cabinets pass through a six-stage washing process and a drying oven, after which a resin primer coat is applied by a flow-coating machine and the units are carried through a vapor chamber for controlled draining. Baking is performed in an infrared oven.

Following this, the conveyor carries doors and cabinets through a spray booth for reinforcing the primer coat, and through a bake oven. After cooling for 20 min, they are carried past booths where the primer coat is sanded and tack wiped.

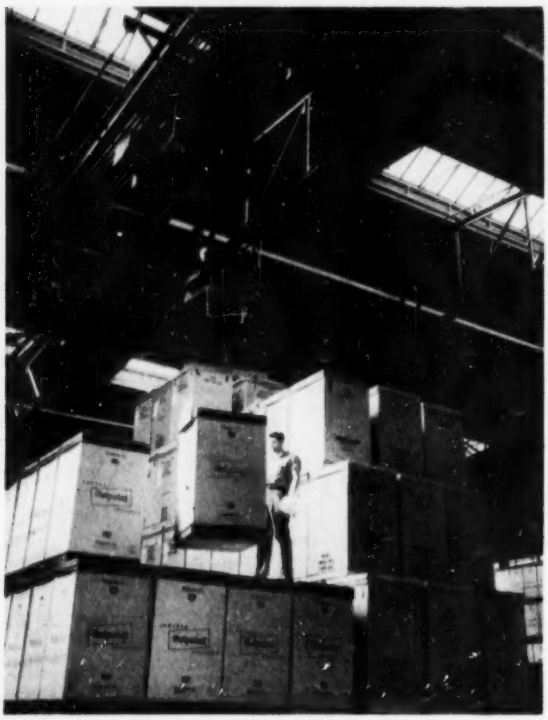
The conveyor is now inverted by a specially de-



BENCH-HIGH WOOD-SLAT CONVEYOR in final assembly area is used for finishing doors prior to mounting them on cabinets. Girls use power tools to attach hardware and gaskets. Blocks on conveyor slats make it possible to locate and hold any standard door



COMPLETED REFRIGERATORS pass on constantly moving final assembly conveyor as inspector gives each a pressure test to check tightness of cabinet and door seal. Results of test are recorded automatically



CARTONED AND CRATED refrigerators and electric ranges brought to storage bays by roller conveyor lines are stacked by overhead cranes. Adequate warehouse capacity enables Hotpoint to make up mixed carloads for shipment to distributors and dealers

signed screw conveyor, and the units are transferred to a grouping conveyor which spaces them 4 in. apart for passage through a Ransberg No. 2 electrostatic paint spray booth. Here, paint particles charged with 90,000 to 100,000v are sprayed from bell-shaped spinners, rotating at 900 rpm. The process is rapid, produces a uniform coat, and reduces paint requirements materially.

Units are then returned to the original overhead conveyor and carried through a touchup spray booth and a bake oven. Finally, they are sealed, inspected, and transferred to a transport conveyor for delivery to the refrigerator assembly line.

As doors and cabinets move toward final assembly, the conveyor passes through an area where 27 different sizes of special insulation are inserted. Cabinets pass directly to the assembly line, while doors go to a subassembly line for addition of parts. This line later delivers the doors to the final line at the installation point.

Final assembly operations are performed on a wood-slat, bench-level conveyor which delivers the completed units to final test stations. Refrigerators approved by final inspectors move by roller conveyor to the crating line, picking up the bottom cardboards for the cartons as they pass an automatic feeder under the roller line. When units have been cartoned individually, the conveyor delivers them to the adjacent warehouse, where the line merges with the conveyor delivering electric ranges from an adjacent plant. Units are fed to six storage bays, or directly to waiting freight cars. Overhead cranes in the storage bays, instead of carts or trucks, eliminate manual handling.

A HANDBOOK OF

Workholding Devices

BY H E LINSLEY
ASSOCIATE EDITOR

PART 1...
ROTATING DEVICES

Every machinist knows the importance of proper workholding devices for securing work in a machine tool, but few are familiar with all the different, standard types available. Obviously, it is impossible to show every known type in this special report, but the conventional, and some unusual examples, are included, together with general information on their application and the way in which they operate.

Apprentices, students, and newcomers into the metalworking industry will find much valuable information to guide them in the selection of the most suitable means of holding a workpiece. More experienced workers may find items of whose existence they were unaware or had forgotten.

This first section is concerned only with holders for work which is machined during rotation. The second section will deal with holders employed for stationary work. There is necessarily some overlap but, in such cases, the items concerned have been classified in the category in which they are most commonly employed.

This Special Report is another American Machinist Service to production executives. It is intended to help train apprentices and new operators of machine tools

American Machinist SPECIAL REPORT NO. 347 TO THE METALWORKING INDUSTRIES

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CENTERS AND DRIVERS

PROBABLY the oldest and certainly the most commonly applied method of holding a rotating workpiece is between centers. The standard plain center, often called a "dead" or "solid" type center, consists of a shank accurately ground to a taper to fit the spindle or tailstock of a lathe, grinder or other machine, and a hardened and ground point having a 60° included angle. This type is entirely satisfactory for lathe headstock use, as it is required only to support the work and hold it centered. There is no relative movement between work and center. For lathe tailstock use, however, it is subject to considerable wear as the work rotates on it. For average work, where loads are relatively light and extreme accuracy is not required, it is still in wide use. But, the ever-increasing demands for greater accuracy with increased speeds and heavier loads have made it necessary to improve wear resistance.

One method of achieving this has been the employment of inserted-type tungsten-carbide-tipped centers. These have shown tremendous service life, even when inadequately lubricated, and when they eventually become grooved or the point broken, they can be reground many times. In selecting carbide-tipped centers, it is important to see that a large enough insert has been employed to permit regrinding. Manufacturers usually mark the shank to show the distance to which the tip may be ground back and still retain sufficient carbide bearing area.

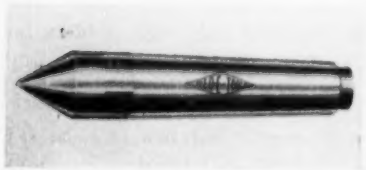
The best method involves the use of anti-friction centers having bearing construction of either ball or roller type. These will retain their original high accuracy almost indefinitely, and reduce abrasion wear on the center point, as there is no relative movement between work and center point. However, the points are designed to permit regrinding. For most work, two single-row bearings provide sufficient rigidity, but for extreme accuracy under heavy loads, the center should be designed with locked-in angular-contact preloaded precision bearings in the head and self-aligning precision roller bearings in the shank. Some models have removable points to permit installation of female or other specially shaped points. Special anti-friction-type centers are built for grinding machines. These are so constructed that overhang is virtually eliminated, and extreme accuracy is obtained.

Most anti-friction centers are designed for taper shank mounting inside the tailstock spindle, but types are available for outside mounting where extremely heavy loads are encountered. These fit over the tailstock spindle and are retained by a conical lock. With all types, the points are finish ground on their own bearings to insure accuracy within 0.0001 in. total indicator reading. This is essential for production of accurate work.

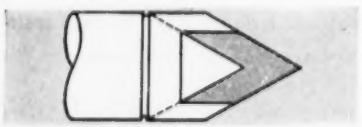
CENTER POINTS

ALTHOUGH the angle of the center point is theoretically 60°, experience has shown that the conventional center drill used for making the center holes in the work rarely cuts an exact 60° angle. Therefore, at least one manufacturer grinds the points to 60° + 15′ + 15′ − 0′ to insure better bearing surface in the center hole of the work and to improve over-all accuracy.

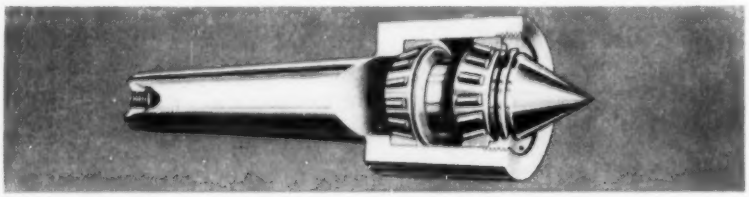
In addition to the conventional point, several special purpose points are available. The pipe-type center has a large head for insertion into the open end of tubular work. The bull-type center is similar to the pipe-type center, but has no point and is commonly made in sizes 6 in. in diameter and over. All kinds of special points can, of course, be made to suit a

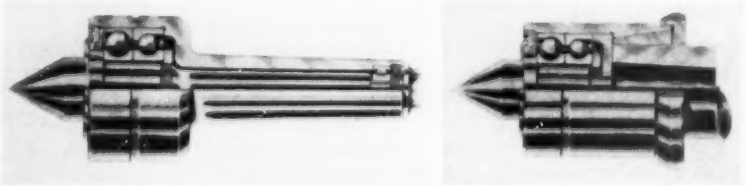


STANDARD HSS CENTER with 60° point is most suitable for headstock use, but is subject to severe wear when used in tailstock

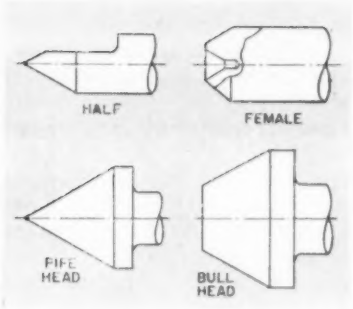


INSERTED CARBIDE TIP with guide line on shank to show how far the carbide can be ground back. When the line is reached, discard the center

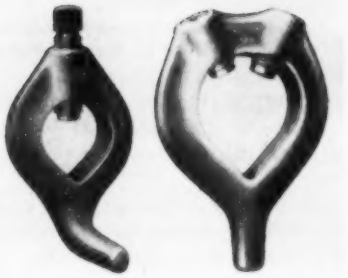




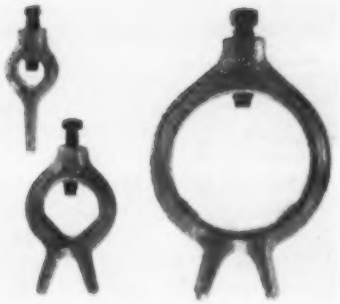
ANTI-FRICTION CENTERS have high load capacity, extreme accuracy, and long life. Tapered roller bearing type (top) has grease port in rear of shank. Heavy-duty model (left) has self-aligning ball bearings in head, roller bearing on shank. Outside-mounting type (right) is intended for extremely heavy work where high accuracy is demanded



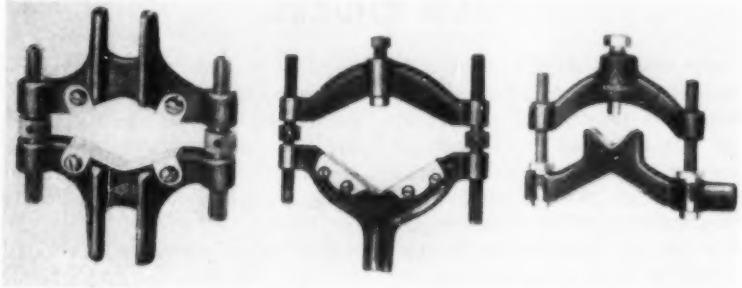
STANDARD TYPES of special center points. The half-center is designed to give clearance for the tool on small-diameter work



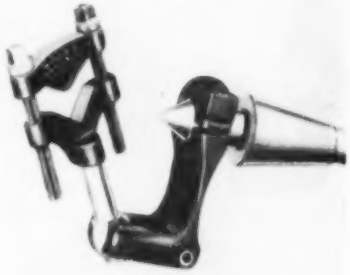
BENT-TAIL LATHE DOG (left) is widely used, but projecting screw presents a hazard. Safety-type (right) with headless screw is much less dangerous



GRINDING DOGS are usually of lighter construction than lathe dogs and often are made with a forked tail to prevent counter-rotation



BALANCED-TYPE GRINDER DOG (left) is tightened by two RH and LH screws. Quick-acting type (center) is tightened by one screw; side screws are for adjustment. Reversible type (right) will accommodate a wide range of different sizes



COMBINATION DOG AND DRIVER for milling machine has shank sliding in hardened ball, avoids cramping and lost motion, insures accurate spacing on taper work and spiral milling

particular application, and it is to be noted that special machine tools for turning and grinding rolls are normally furnished with 70°, 80°, and 90° included angle centers instead of the standard 60°.

It is of the utmost importance that solid centers be properly and adequately lubricated when in use. Ordinary lubricating oil is not suitable because of the high pressures generated and the small bearing area. The most common lubricant is a mixture of white lead and oil, although special center lubricants are on the market. Anti-friction bearings may be of the sealed, permanently lubricated type which require no periodic oiling, or the center may be equipped with a grease fitting for regular greasing with a grease gun. Before installing centers in a machine, check the taper and the shanks for nicks and burrs. Remove burrs with a fine stone, not with a file. Wipe the shank and the hole with a clean dry cloth to remove all oil and chips. If the point is burned or grooved, regrind it before using, taking care to maintain the exact original angle.

DRIVING DOGS

To obtain rotation of work held between centers on a lathe, a driving dog must be employed. The common type consists of a heart-shaped forging having a heart-shaped hole. Round work rests in the V of the hole and is clamped by one or more capscrews which project from the rounded portion. A tail extends from the pointed end and may be straight or bent at a right angle. The bent tail is designed to engage in a slot in the machine faceplate; the straight tail engages a stud or other projection on the faceplate.

Common dogs employ a square-head screw, but this is often considered dangerous as it may catch the operator's clothing if he is filing or working close to the driver. The safety dog is, therefore, preferred. This has headless screws with a square or hex hole for a special wrench. A single screw is adequate for most work, but two screws are fitted for large or extra heavy work. Dogs are made in a wide range of sizes to suit work diameters from about ¼ in. to 6 in. When using a dog on finished work, wrap a piece of thin brass around the work to prevent damage by the screw and sides of the V opening.

For use on grinding machines, straight-tail lathe dogs may be employed, although a forked-tail type is more common. The driving pin on the faceplate fits into the fork to prevent counter-rotation. Also available, however, and frequently preferred, is a two-piece dog in which the two V-shaped parts

are drawn together by right- and left-hand screws. The wide range of adjustment on this type makes it possible to cover all sizes of work, from ¼ in. to 6 in. with only four dogs. One model has two V-shaped jaws, brass faced, and is designed to be always in balance. Another type has a single V-jaw, brass-faced, and a brass-tipped clamp screw. This is somewhat faster to operate, as there is only one screw to operate; the side screws permit adjustment for different diameters. For milling machines, standard bent-tail lathe dogs may also be used, but it is preferable to select a special type in which the sides of the tail have been machined to provide a more accurate fit in the faceplate or driver. The tail is locked to the driver with setscrews to prevent backlash.

An entirely different type of dog, particularly suited to production grinding, is the cam-action dog. A smooth-faced cam locks the work against two preset screws by pressure from the driving pin. When drive is stopped, finger pressure on the cam releases the work.

Somewhat similar is a cam-action driver for spindle-nose mounting which automatically grips and centers the work between three serrated jaws linked together through pivot plates which transmit radial forces between jaws so all are equally loaded. The pipe-wrench action of the jaws causes them to tighten their grip as the torque load increases. Jaws are adjustable and interchangeable.

PLAIN MILLING MACHINE DOG (top) has flattened tail for close fit in faceplate or driver slot; tail is usually held with setscrews. Cam-action dog (right) locks work by pressure of driving pin on cam arm, can be unlocked by pressing arm in opposite direction

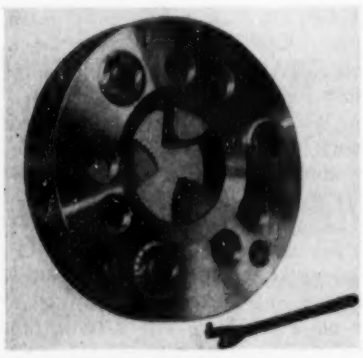
JAW CHUCKS

CONVENTIONAL chucks so widely employed in modern industry were introduced only about 100 years ago, but it would be difficult to conceive now of operating a lathe without them. And although they are commonly called lathe chucks, they can be adapated to a wide variety of other machine tools, including grinders and millers.

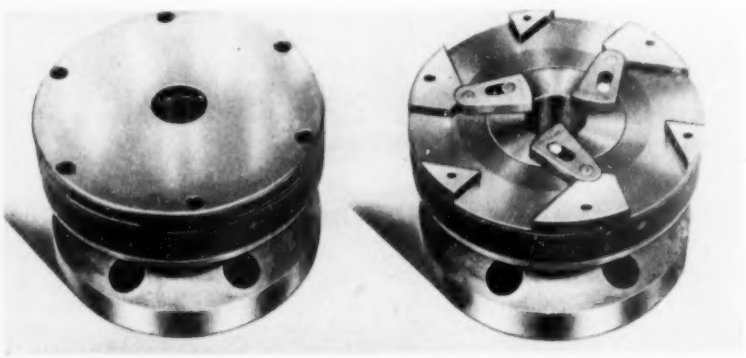
The independent chuck is usually made with four jaws designed to move radially in slideways cut in the chuck body. The body may be alloy cast iron, a steel forging, or a steel casting, depending chiefly on the class of work it is to handle; that is, light, medium or heavy duty. Concentric circles are scribed on the outer face to facilitate setting the jaws, and ringbolt holes are usually provided on the larger sizes for easier handling and mounting. Larger sizes commonly have T-slots and bolt holes equally spaced between the jaws to permit installation of additional clamps, counterweights, or locating blocks.

For high-speed work, the body may be provided with a series of lightening holes in the rear face, or may be deeply recessed, or made from aluminum alloy.

Jaws are made of alloy steel, heat treated for maximum performance, and are made with three or more steps to accommodate different sizes of work. They are usually ground after assembly to insure accuracy, although this is not always necessary. Work may be gripped on the OD or ID by simply reversing the position of the jaws.

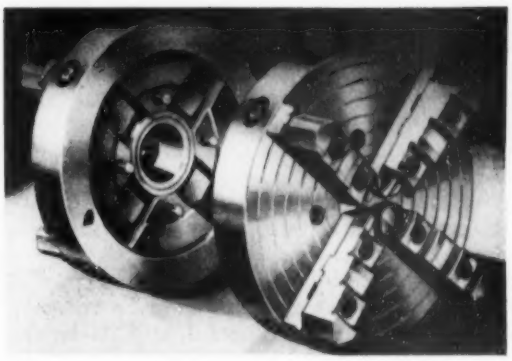


AUTOMATIC WORK DRIVER is mounted on spindle nose, gives balanced driving torque to work held between centers. Widest use is on automatics, but it can also be used on other lathes and grinders



RADIAL FLOAT on automatic work driver attached to spindle nose compensates for work eccentricity. Removing cover plate (right) permits easy changing of jaws for different sizes

← Standard, four-jaw independent chuck, manually operated, can grip work on OD or ID by reversing jaws, permits accurate centering even of irregular work, but requires time and skill



DUST-PROOF CHUCK is→ specially designed for grinders or particularly dusty applications, has its operating mechanism fully enclosed to prevent entry of harmful foreign matter

INDEPENDENT CHUCKS

RADIAL MOVEMENT of the jaws of an independent chuck is effected by heat-treated screws set into the chuck body and engaging with thread forms cut in the back of the jaws or jaw bases. Thrust bearings are fitted into the body to absorb the thrust and prevent the screws from moving in or out. Screws are turned by a hand wrench inserted into a square or hex hole in the outer end.

The four individually adjustable jaws of the independent chuck make this type particularly suited to holding irregularly shaped work. Although the individual adjustment of each jaw consumes a certain amount of time, extreme accuracy is obtainable and, with sufficient care, it is possible to center the work within a few ten-thousandths of an inch. Gripping strength is extremely high, which permits heavy roughing cuts.

A variation of the standard chuck is the dust-proof chuck intended for use on grinders or in extremely dusty locations. It is similar to the regular type, except that special precautions are taken to prevent the entry of dust into the mechanism. The jaws are usually of two-piece design—see below—and, depending on the maker, the master jaws may be of full-nut construction, that is, the bottom section of each consists of a nut completely surrounding the operating screw. They are also made of sufficient length as to cover the jaw slots at all times. Operating screws have double thrust collars which also serve to seal the body openings around the screws. The center hole in the body may be closed by a suitable plug.

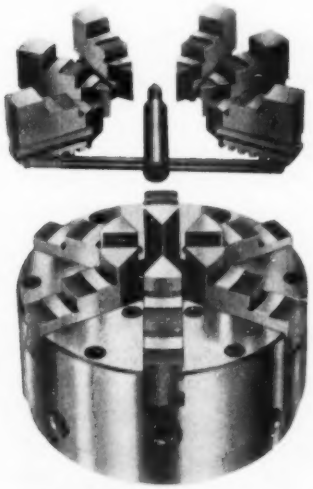
SELF-CENTERING CHUCKS

SELF-CENTERING chucks derive their name from the fact that all the jaws move equally and in unison with a single application of the wrench. The name Universal chuck is sometimes applied to these tools, but this would tend to imply that the chuck was capable of handling all kinds and classes of work, and the term is not generally recommended.

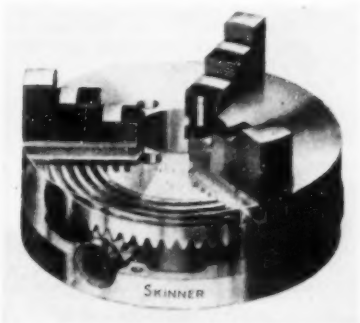
There are two major types; the geared scroll chuck and the geared screw chuck, both of which are usually made with three jaws. If a workpiece is out of round, it can be gripped firmly and will be centered automatically by three jaws. If there were four jaws, two might grip; one just touch, or grip lightly; and the fourth not bear on the work at all.

A spiral thread generated on the surface of a scroll plate engages the thread form on the back of the jaws and causes these to move in or out as the scroll is rotated. Both square and angle threads are used, the square thread having the advantage of producing a direct thrust. The back of the scroll plate has radial teeth which engage the teeth of three pinions equally spaced around the inside of the body. Turning any one of these three pinions by a wrench inserted into a hole in its outer end will rotate the scroll and move the jaws.

The accuracy of such a chuck



ACCURACY WITHIN 0.0005 in. is obtainable with this chuck, available in three- and six-jaw types, by micro-adjustment of four screws shown near back plate



SELF-CENTERING three-jaw chuck operates by means of a scroll plate rotated by any one of three pinions. Separate jaws must be used for internal gripping

depends on the precision with which the scroll has been cut and upon the fitting of the plate to its hub. The best makes will hold work true within 0.003 in. full indicator reading, and this is usually quite close enough for most work. If a higher degree of accuracy is required, a four-jaw independent chuck is usually employed. However, there are now available three- and six-jaw self-centering chucks which can be adjusted dead true, and 0.0005-in. accuracy can be obtained on repeat operations. This accuracy is obtained by four opposed screws which work from an undersized pilot on the adapter.

Because all jaws can be tightened equally and quickly, the geared scroll chuck is particularly well suited to general tool-room and production work when the shape of the piece is such that it can be held accurately between three jaws. The leverage obtained through the gear ratio of pinion and scroll plate permits application of extremely high pressure between the jaws and the work and permits heavy cuts, even at high speeds.

Geared screw chucks find their greatest use on grinders and milling machines, but are also employed to some extent on lathes for light-duty work. The screw principle makes possible a thinner body, resulting in less overhang, and the operation of the jaws is much faster than on a scroll chuck. Master jaws include a full nut which moves up or down a screw carried in the chuck body. Each screw has a pinion near its outer end to mesh with a bevel rack gear. Turning any one screw moves the attached jaw and simultaneously rotates the gear which revolves the outer pinion screws an equal amount. The screws on these chucks are usually made with square or hex heads to fit a socket wrench.

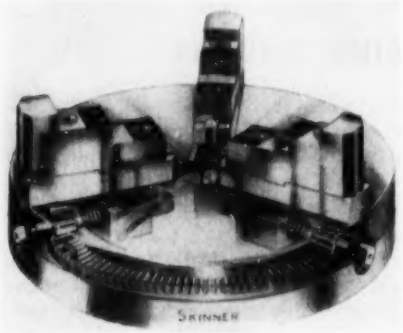
Jaws are of the two-piece type, and reversal is obtained by reversing the top jaw only. When designed specifically for milling machines, solid, non-reversible jaws are usually furnished with a long end bite extending well below the chuck face to insure a good grip on the work.

A variation of the standard scroll chuck has the bevel gear exposed on the rear face where it can be turned by a wrench which carries a mating pinion. For fast movement of the jaws, the end of the wrench stem is inserted into any one of six holes in the front portion of the body, and the scroll is turned by simple leverage. For gripping, the wrench stem is inserted in one of six holes in the rear part of the body so the pinion engages the bevel gear. The scroll is then rotated by turning the wrench. This type is presently available only in the 5-in.-dia body size and with a threaded mounting hole.

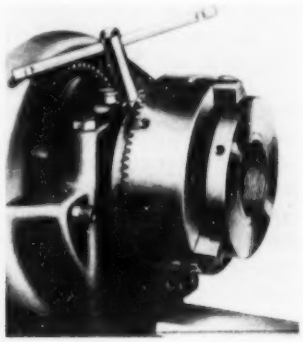
COMBINATION CHUCKS

THE ADVANTAGES of both independent and scroll chucks are combined in the combination chuck. Each jaw can be operated separately, or all together. This is particularly advantageous when a number of identical but odd-shaped pieces are to be machined. The jaws can be adjusted individually to center the first piece, then opened and closed simultaneously to center the remaining pieces automatically. Jaws are adjusted by applying a wrench to each jaw-adjusting screw; scroll action by applying the wrench to any pinion. Both three- and four-jaw types are available.

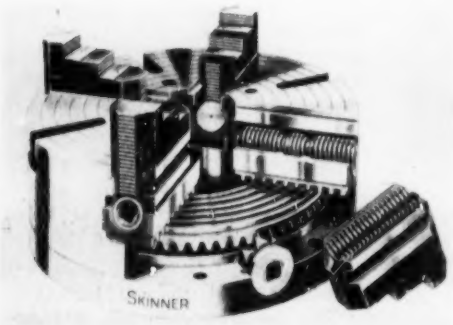
This type of chuck is frequently employed when great accuracy is



GEARED SCREW CHUCK is self-centering and has thinner body than scroll chuck. Gripping power is not so high, but the shorter overhang makes it well suited for grinding

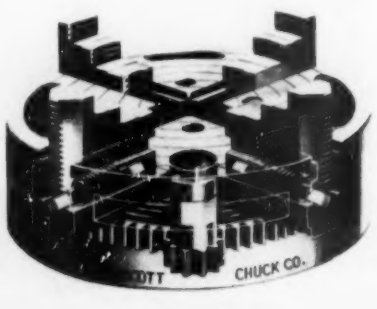


FAST ACTION is obtained on this chuck by rotating the body, using wrench handle in one of holes just ahead of teeth; final clamping is by engaging wrench pinion with gear teeth



← Combination scroll chuck combines the advantages of both independent and self-centering types. Jaws are adjustable individually, then closed and opened simultaneously

FRONT OPERATION of the → self-centering action of this combination chuck is obtained by spur gear and pinion; independent jaw operation by screws on the periphery of the body

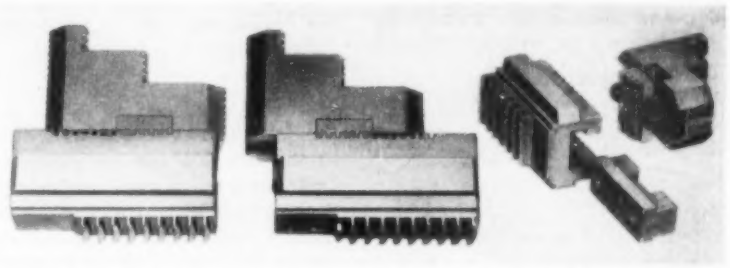


required. It is operated as a self-centering chuck to the desired point, then each jaw is adjusted independently to the desired degree of accuracy. Because the independent mechanism is in the front, and the jaws are the same as in an independent chuck, solid jaws are reversible. Two-piece jaws are also available.

An interesting device built into one make is a spring-controlled ball latch which seats in a hole in the bearing end plate at each revolution of the jaw screw with a feelable click. If the jaws have been individually adjusted, they can be centered quite readily by moving them individually until their ends are in approximate relation to the same observation line on the chuck face, then turning each screw until the index pin clicks in its groove. The jaws will then be centered true within 0.005 in.

Combination geared screw chucks, in either three- or four-jaw types are similar to self-centering screw chucks, except for the mechanism which permits them to be used as independent chucks. This consists of a cam ring placed in the back of the chuck in contact with the back of the gear. Movement of the cam ring—by a stud projecting through the rear face—forces the gear into mesh with the pinions for self-centering action. Movement in the opposite direction relieves the pressure, permitting the gear to float free of the pinions and resulting in independent action for each jaw.

STANDARD JAWS for independent and combination chucks may be solid or of two-piece construction. Top jaw can be reversed in master jaw for internal or external gripping

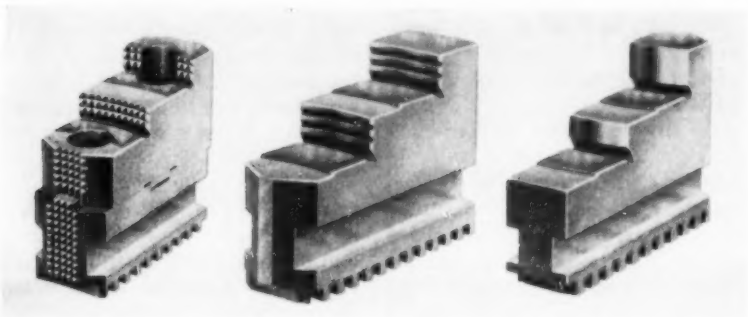


VARYING POSITION of locking key on master jaw and turning end for end permits positioning top jaw in increments of ⅛ in. so master can have maximum support in chuck body and have all teeth engaged with scroll

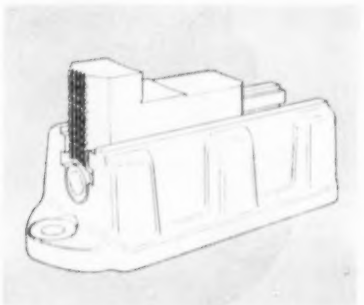
CHUCK JAWS

STANDARD CHUCK JAWS are made in two principal types; the solid jaw, and the two-piece, reversible-top jaw. The former is made in two styles; one for gripping work on the OD and one for gripping in the ID. Both styles are required on scroll chucks because the curvature of the teeth engaging the scroll prevents their being reversed. There is, however, one type of scroll chuck, designed for light duty only, in which the jaws are reversible because the teeth are made with a radius on each side. This results in only one-point bearing, and reduces the strength of the jaw. Nevertheless, it is entirely satisfactory for small, light work. On independent chucks, only one style of jaw is needed, as they are readily reversible; no scroll being employed.

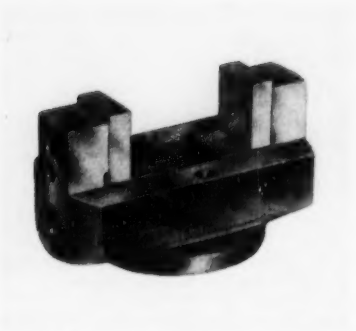
Reversible-top jaws are made in two parts, a master jaw and a top jaw. The master jaw remains in the chuck; the top jaw is attached to it by capscrews and a tongue-and-groove joint. In some cases,



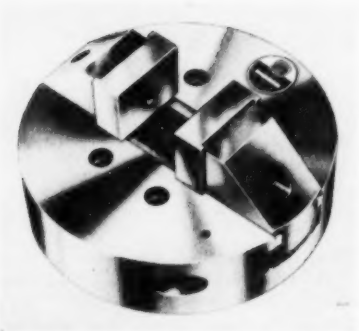
SOLID AND REVERSIBLE JAWS for scroll chucks. Grip patterns vary according to service required; smooth for finished work, straight creases for average work, serrated for rough work



FACEPLATE JAWS will grip large work on boring mills or faceplates

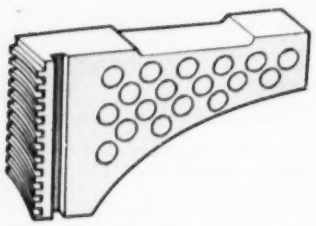


BOX-BODY, TWO-JAW, self-centering chuck with center operating screw is suitable for work which does not need center clearance



ROUND-BODY, self-centering, two-jaw chuck has side operating screw to provide clear hole through center

INDEXING JAWS on this chuck permit several operations to be performed without removing work from chuck



LONG-NOSED, VENTILATED JAWS designed for holding glass or other material which must be heated during forming. Special chucks are usually made for such work

WRENCHLESS CHUCK is operated by pulling or pushing nonrotating lever, is particularly suited for chucking machines and for long work

the jaws are equipped with teeth so the top jaw can be positioned on the master in small increments. Some makes have precision adjustment by means of a screw which moves the jaw in either direction. The particular advantage of adjustable top jaws is that the top jaw may be moved to maximum in or out position while still keeping the teeth of the master jaw in full engagement with the scroll.

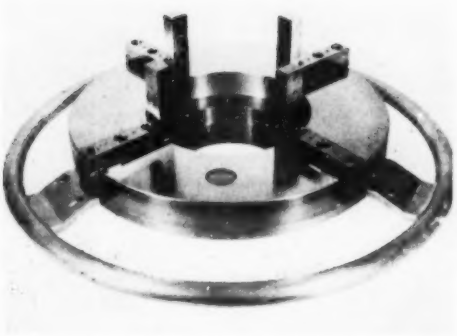
Jaw patterns vary with different manufacturers, but commonly have three steps, or bites, for gripping the work. The gripping surfaces may be smooth for holding finished work which must not be marred, or may have straight creases or cross serrations. The latter are employed mainly for rough, unfinished work, as they may mark the surface quite deeply. All types are hardened for maximum life, unless specially ordered soft.

In addition to the above standard types, soft blank jaws are available. These are machined by the user to fit some particular shape of workpiece, and may or may not be hardened after shaping. Other completely special jaws may be designed for specific purposes, such as long-nosed, ventilated jaws for holding glass or other material which must be heated for performance of a forming or sealing operation.

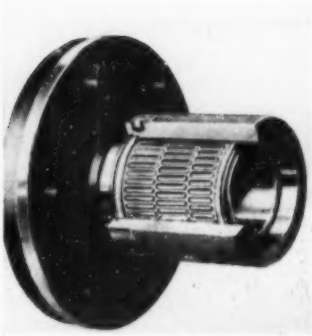
TWO-JAW CHUCKS

FOR HOLDING odd-shaped work on turret lathes and screw machines, the two-jaw, self-centering, chuck is particularly applicable. It is usually made with removable jaws, "slip jaws" which are shaped by the user to suit the particular piece of work being handled, and which are held in the carrying jaws by screws and locating grooves. Operation is by a right- and left-hand screw retained in the chuck body and turned by a suitable wrench. On some models, the operating screw is placed off center to provide a hole through the center of the body. This can be equipped with a hardened steel bushing for center-pilot tooling or merely to allow work to pass through the center. A plug may be employed to close the hole and prevent entry of chips, when so desired. These chucks may be made with a round body, similar to a standard chuck, or with a so-called box body.

A variant of this chuck is made with special jaw holders which can be rotated and locked by a latch engaging in an index plate. This saves multiple handling and chucking of work which has more than one face or opening to be machined, as valves and plumbing fittings. This type is employed almost exclusively on turret lathes, and often makes it possible to use all turret positions when some operations require the use of only a single tool. Work may be indexed through a full circle.



HANDWHEEL OPERATES SCROLL to open or close jaws on this chuck designed especially for holding glass parts for hot forming



JAWLESS CHUCK holds work by compressive action of rollers on wall of chuck body, insuring full contact on periphery of work

SCROLL CHUCK with extra master jaw permits quick conversion from three-jaw to two-jaw, saves buying extra chuck

SPECIAL CHUCKS

IN ADDITION TO the standard chucks described above, there are many special chucks of both standard and special-purpose types. One of these is the wrenchless chuck which is operated by a lever attached to a collar on the rear of the chuck body. One pull on the lever grips the work; one push releases it. The lever does not rotate, so there is no danger to the operator. Both two- and three-jaw types are available. On hand machines, this type is usually hand operated; on automatics, the lever is operated by an air cylinder and linkage. This not only gives automatic operation, but permits the use of tools held within the spindle for back-boring operations.

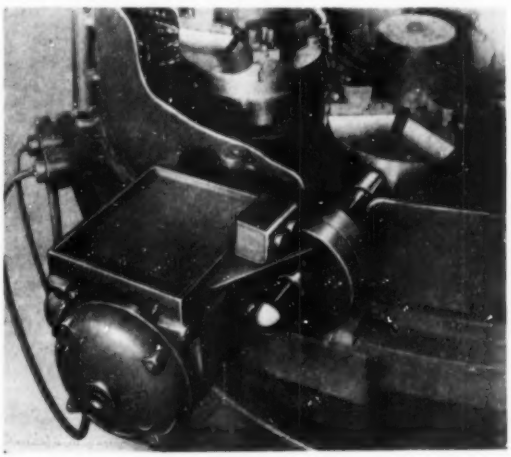
Another type has a handwheel in the rear of the body which operates the scroll. A quick turn of this operates the jaws.

A completely different type grips the work by a series of rollers. When an actuating ring is turned clockwise, the rollers (held in a cage at a slight angle to the centerline of the work) force the ring toward the chuck flange along a taper. This sets up a wedging action, compresses the wall of the chuck body and eliminates all clearance evenly along the chucking surface, thus creating a powerful grip on the work. A slight twist in the opposite direction frees the work, but it cannot be freed by reversing the rotation of the tool or by shock or vibration.

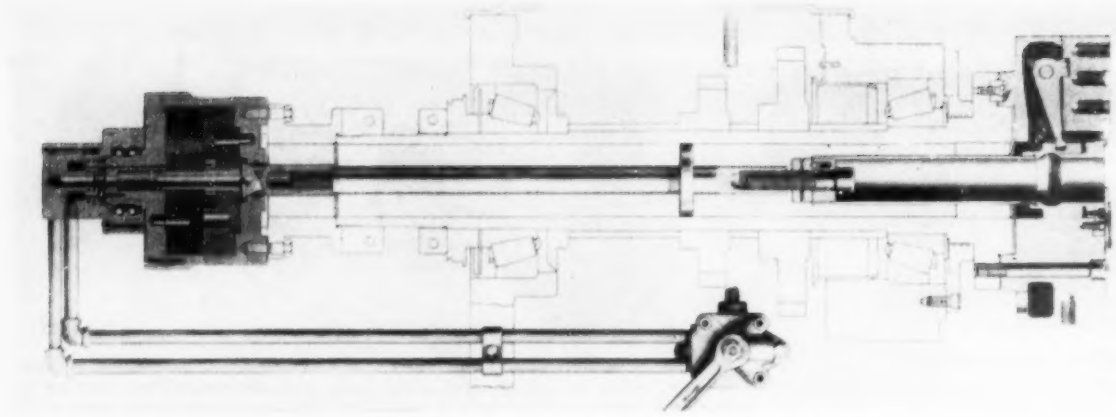
For large faceplates and boring mill tables, separate jaw units are available from most chuck manufacturers. These have a sturdy body for bolting to the plate, and are positioned by a tongue which fits into the T-slots. The jaws slide in the body, as in an independent chuck, and are adjusted and tightened individually, so the faceplate or table becomes, in effect, a large chuck.

The development of the facing lathe (T-lathe) has brought about a need for suitable means for holding large-diameter work, and special chucks are being made for the purpose. Because of the light sections involved in the work and the particular shapes encountered, these chucks must be constructed to suit each individual job. The operating principles, however, are similar to those of standard chucks, and they belong in this class rather than that of special fixtures.

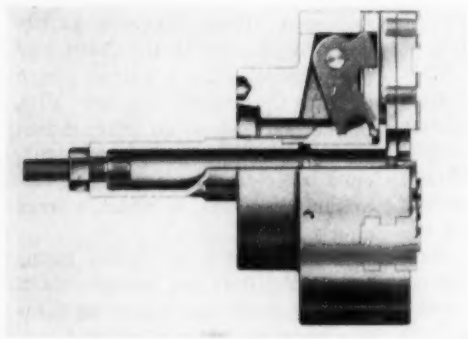
SPECIAL T-LATHE CHUCK for facing large components of jet engines and similar parts. Multiple jaws can be designed for gripping narrow flanges



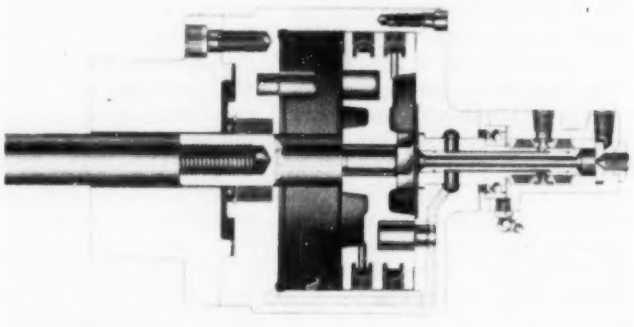
POWER WRENCH can be attached to lathes and other machines to open and close chucks by electric power, reducing operator fatigue



TYPICAL ARRANGEMENT of air cylinder, drawbar, and power chuck. Control valve (front) can be hand or foot operated at most convenient location



BELL-CRANK-OPERATED chuck with special design of cam-operated levers for maximum gripping power on heavy cuts



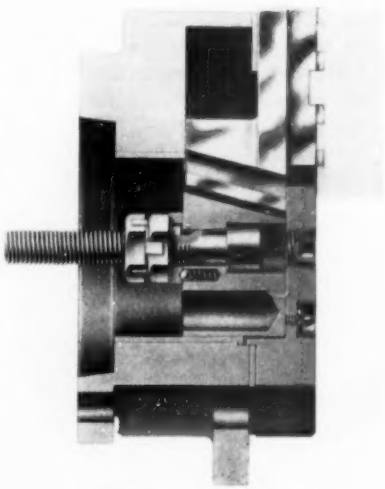
ROTATING AIR CYLINDER supplies power for air-operated chucks. Designs vary with different manufacturers but basic principle is the same

Other chucks, available as stock items but differing from standard chucks, include a convertible three-jaw chuck which can be converted into a two-jaw self-centering chuck by inserting a separate jaw into a slot opposite one of the regular jaws.

Cutting-off chucks are usually made with unstepped jaws provided with special serrations for maximum holding ability. Milling machine chucks are similar, but have smooth jaws shaped to permit a long bite without using too much of dividing head center distance.

Standard drill chucks are sometimes employed for workholding, although this is not their proper function.

An interesting attachment, particularly suited for use with multi-spindle chucking machines, is the power wrench. This consists of a constant-speed, reversible motor which applies power to a sliding wrench shaft through a gear train. When power is applied to the motor, the wrench shaft slides forward, engages the wrench hole in the chuck, and opens or closes the jaws. When the preset closing pressure is reached, the motor stalls and the shaft withdraws. Pressure can be varied through a multi-position switch.



WEDGE-ACTUATED power chuck has few parts, is easy to adjust. Slight angle of taper prevents release of work if air pressure fails

POWER CHUCKS

Both two- and three-jaw self-centering chucks can be operated by power—usually by compressed air, although electric and hydraulic chucks have been made. They are particularly suited to high-production work on screw machines and turret lathes, but are used to some

extent on engine and other lathes.

Power chucks perform the same functions as hand-operated self-centering or combination chucks, and the jaws are similar. Compressed air, usually at 80 to 100 psi, passes through a filter to remove dirt, then through a unit consisting of a pressure regulating valve, a pressure gage, and a lubricator. By varying the pressure at the regulating valve, it is possible to control the gripping pressure of the chuck jaws. The lubricator feeds oil into the line to lubricate the moving parts of the air cylinder. A hand- or foot-operated control admits air to one side or other of the piston to open or close the jaws. A draw bar or draw tube passes through the hollow spindle of the machine and connects the piston to the actuating mechanism of the chuck.

Jaws are commonly actuated in one of two ways; by wedge or by bell crank. In the wedge type, the inner end of each actuating, or master, jaw is a T-shaped section machined at an angle. These sections fit into T-slots machined in the actuating wedge attached to the end of the drawbar. In conventional manufacture, when the drawbar is pulled back by the action of the piston, the jaws are pulled downward to grip the work and, for internal gripping, the jaws are expanded by forward movement of the drawbar. However, in some cases this action is reversed. The wedge angle is such that once the jaws firmly grip the work in any position, they will not release it, even if air pressure fails.

In the bell-crank type, each jaw is operated by a small bell-crank which has a short arm engaging a slot in the rear of the master jaw, and a long arm engaging a grooved collar on a shaft attached to the drawbar. For work which is not perfectly round, some chucks incorporate a plunger arrangement having slotted cylindrical bearing members in which the jaw levers ride and which allow free float in any direction as the jaws move to conform to off-center position of the work. Some also have the master jaws individually adjustable to compensate for wear, and others have the top jaws equipped with micrometer adjusting screws to insure exact centering.

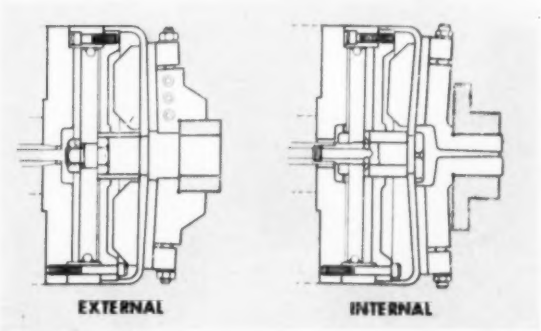
Most types of air chucks are provided with a hole through the center to accomodate short bars, provided they do not extend too far back into the spindle. This also serves to hold work having a tail end extending through the chuck and as a guide when center piloting in the chuck is desired. In these cases the draw rod is replaced by a draw tube.

Air cylinders are produced by power chuck manufacturers, as well as by companies specializing in the air cylinder field and, while all are similar in function, they differ considerably in design details. The more common type consists of a sturdy body, or cylinder, attached to the rear end of the machine spindle. In this is a double-acting piston connected to a draw bar which operates the chuck mechanism. Air seals are provided to prevent escape of air around the rod and at the non-rotating end-cap through which air is admitted. Bodies may be cast iron or steel or, for high-speed work, aluminum alloy.

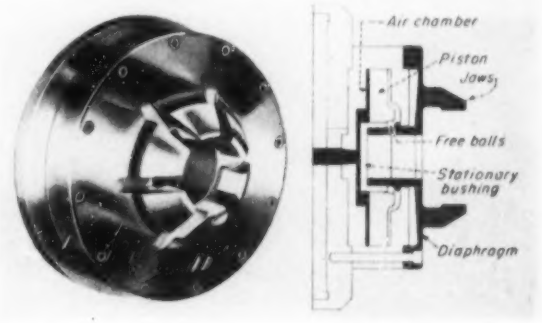
DIAPHRAGM CHUCKS

THE OUTSTANDING FEATURE of the diaphragm chuck is its ability to repeat with extreme accuracy under production conditions. Gripping action is accomplished by the elasticity of a highly tempered steel diaphragm which is caused to flex by the action of an air-operated piston. When sufficient power is applied to the diaphragm to cause it to bulge, the jaws flex open enough to admit the work. When power is released, the diaphragm returns to its relaxed position and the jaws clamp the work. Production tolerances of 0.0002 in. total indicator reading are readily obtained.

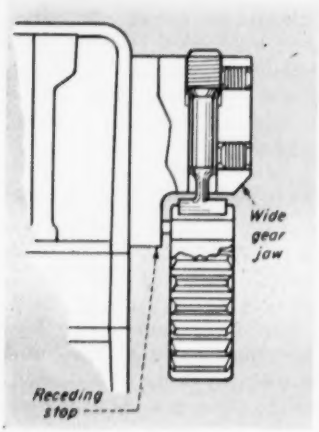
In one type, the jaws are integral with the diaphragm which can be replaced to suit different diameters of work. In another type, jaws are mounted on the diaphragm and are replaceable and individually adjustable. Both types have built-in air cylinders to elim-



DIAPHRAGM CHUCKS for external gripping (left) and internal gripping (right). This type has removable jaws that can be made to suit a wide variety of work



JAWS INTEGRAL WITH DIAPHRAGM, and multiplication of piston thrust by arrangement of balls and tapers permits high gripping pressure. Diaphragm is replaceable for different sizes of work



GEARS MAY BE HELD in diaphragm chucks by using special jaws equipped with shaped pins to fit between teeth

GRIPPING ACTION on this gear chuck is achieved by partial rotation of small pinions meshed with gear through camming action

inate end thrust on spindle bearings, and both can be designed for either internal or external gripping. For long work on which it is desirable to grip in two places on the same or different diameters, double - diaphragm chucks are available. These operate from a common cylinder so both sets of jaws open simultaneously, but when air is exhausted they close independently, so variations in chucking diameter sizes have no effect on concentric chucking.

GEAR CHUCKS

ACCURATE POSITIONING of gears to obtain concentricity between the pitch line and the ID or OD can be achieved by a special gear chuck.

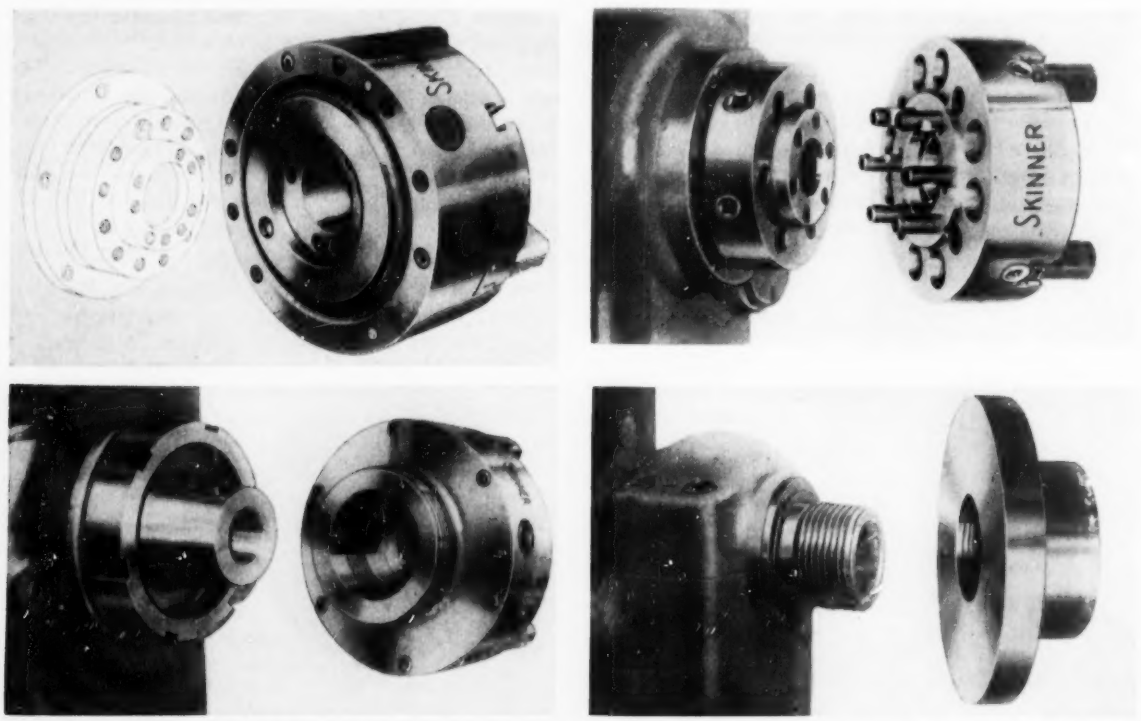
For spur and helical gears, a diaphragm chuck can be used to advantage by replacing the standard jaws with special jaws equipped with properly shaped pins to engage the gear tooth spaces.

A different type of gear chuck employs three or more mating pinions to position the gear. Clamping may be by simple clamps, or by a cam action achieved by rotating the pinions.

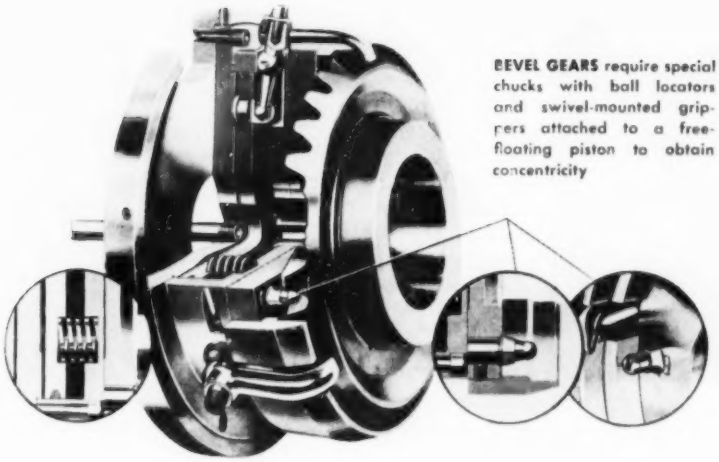
For bevel gears, an air-operated chuck provides location by carbide ball locating pins. Clamping is by fingers connected by ball joints to the piston which is free to tilt to achieve centralization.

Gear chucks are not stock items, but must be engineered to suit the particular gear involved. However, in most cases, the major components are standard, so the basic chuck can be adapted to a variety of work by installing the necessary special elements.

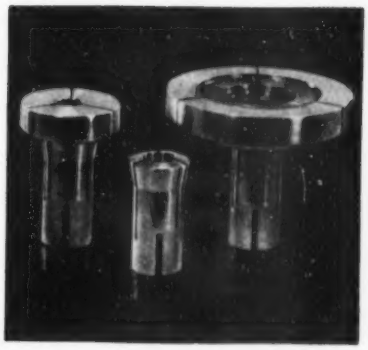
Sometimes called pitchline chucks, because they actually grip the work at the pitch line, these chucks represent the only practicable means of holding gears with absolute concentricity.



STANDARD AMERICAN SPINDLE NOSES and corresponding types of chuck backs. (Top left) American Standard type; (top right) Cam Lock type; (bottom left) Long Taper Key Type L; (bottom right) Threaded Nose and Adapter



BEVEL GEARS require special chucks with ball locators and swivel-mounted grippers attached to a free-floating piston to obtain concentricity



COLLETS AND STEP CHUCKS are ideal for holding small work with high accuracy. Plain draw-back collet, left; step chuck, center, with center hole only; step chuck, right, bored to suit workpiece

SPINDLE NOSES AND ADAPTERS

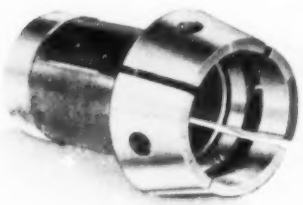
MOST MODERN, American-made machine tools are equipped with standard spindle noses to which chucks may be mounted directly. Older types, and some foreign machines may require a special adapter plate. American Standard Type A-1, A-2, B-1, and B-2 are used mostly on turret lathes and chucking machines. Type A-1 is most common, but all types have the same short taper and over-all dimensions for any one size. Style A-1 has tapped holes on both inner and outer bolt circles; A-2 has tapped holes on the outer bolt circle, no holes on the inner circle; B-1 has drilled holes on the outer circle, tapped holes on the inner circle; B-2 has drilled holes on the outer circle, no holes on the inner circle.

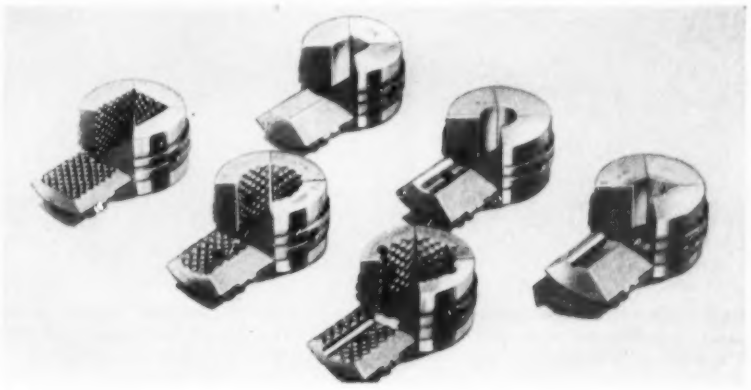
All American Standard Type spindles have a short taper which fits into a tapered recess in the back of the chuck, and a drive button which engages a counterbore in the rear face. Mounting screws for attaching the chuck to the spindle nose are furnished by the manufacturer.

Cam-Lock Type D-1 is used by some manufacturers for tool-room and engine lathes. A short taper on the spindle nose fits into a tapered recess in the back of the chuck. A series of cam locking studs, attached to the back of the chuck, are inserted into holes in the spindle nose and locked by tightening locking cams situated in radial holes in the spindle flange.

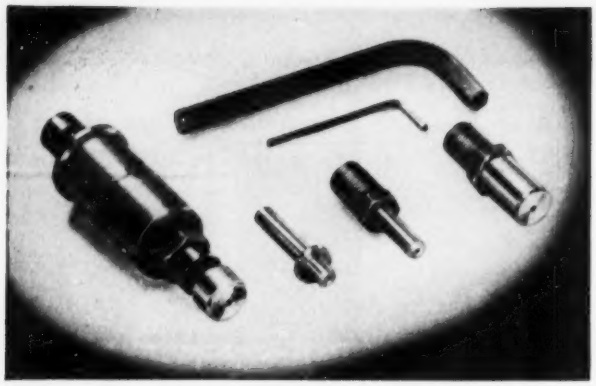
Long Taper Key Type L is also used for toolroom and engine lathes. The spindle has a long taper and key which fits into a long tapered hole and keyway in the chuck. The chuck is mounted by engaging the key in the keyway and sliding the chuck back on the taper. A threaded collar on the spindle is then engaged with the thread on the back of the chuck and pulled up tight.

Threaded spindle noses are still furnished on some machines, and chucks are made with threaded backs for direct mounting. Because of the number of different diameters and pitches, however, this may prevent a chuck from being mounted on other than one particular machine. General practice, therefore, is to employ an adapter plate accurately machined to fit the machine spindle and the adapter recess on the chuck back. Such adapters are machined by the user.

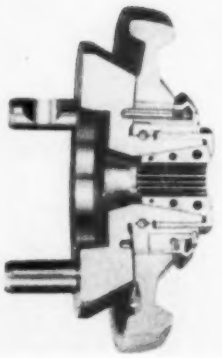




MASTER COLLET, push-in type, with removable jaws (right) can be used for a great variety of different shapes and sizes of work and offer maximum economy



← **COLLET STOPS,** with or without spring ejectors, permit accurate positioning of work to depth by means of adjustable inserts



RUBBER COLLETS made → of alternate strips of rubber and steel, held in special collet chuck, have tremendous gripping power and fit wide range of sizes

COLLETS AND COLLET CHUCKS

IN ITS SIMPLEST FORM, a collet is a small, accurately made sleeve, one end of which is threaded and the other split into three or more sections. The standard type has a circular hole for round work, but collets for square, hexagonal or other shapes can be furnished. In addition, master collets are available. These are equipped with detachable pads to suit a variety of different sizes and shapes of work.

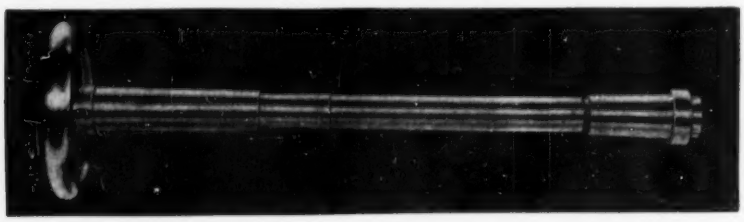
The collet is heat treated to spring temper so the segments may spread and contract slightly without taking a permanent set. The piece to be held must be almost the same size as the capacity of the collet, the difference between the two diameters being taken up when the segments are contracted. Standard collets are commonly made in steps of 1/32, 1/16, ⅛, or ¼ in.

The outside is machined as a cylinder for most of its length, flaring out into a cone at the front, or gripping, end. The collet fits into a collet adapter, the inside of which is ground to fit both the straight and tapered parts of the collet. The adapter fits inside the spindle nose.

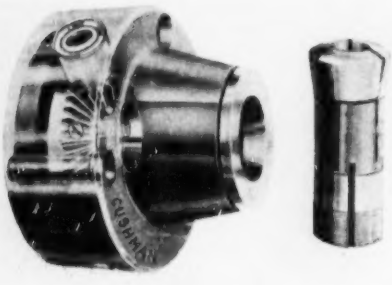
When the collet is pulled back into the spindle, the flared part of the adapter bears on the conical surface of the split segments and compresses them. The segments move simultaneously toward the center and grip the work tightly and accurately. When the machining operation is finished, the pull on the collet is relieved, permitting the segments to spring open and release the work. For accurate positioning within the collet, adjustable collet stops are available. These may be plain, or may incorporate a spring work ejector.

Step chucks operate on the same principle as draw-in collets for quick and accurate chucking of parts requiring only a short grip. They are, in effect, collets with oversize heads, and can be made with a single diameter or with two or more steps to receive work of various sizes. Depending on the particular design, step chucks may be used in standard collet chucks or may require a special closer adapter.

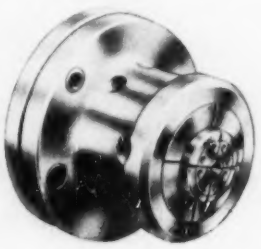
A departure from the standard spring collet is a special type built up of alternate strips of steel and rubber. The flexibility obtained by this design reduces the number of collets required, and eleven collets will handle all diameters of work from 1/16 to 1⅜ in. The grip is aways parallel with the work axis, so there is no possibility of slipping or marking the work. The chuck is operated by a handwheel and incorporates an impact mechanism which insures tight gripping and easy opening by a quick flick of the wrist.



HANDWHEEL AND DRAWBAR is standard method of pulling collet back into adapter on engine lathes



BEVEL GEAR AND PINION, operated by conventional chuck wrench, move collet in or out in this simple arrangement



POWER-OPERATED COLLET chuck has drawbar connected to air cylinder for rapid operation and reduced operator fatigue

Collet Closers

The commonest method of pulling the collet into the adapter is by a draw tube. This has one end threaded internally to fit the collet threads; the other end has a handwheel for turning the tube. The tube is inserted from the rear end of the hollow spindle, and the handwheel turned to engage the threads. Continued turning draws the collet into the adapter to grip the work.

On automatic and high-production machines, the collet action is usually reversed in that it closes when pushed into an adapter attached to the spindle nose. Closing may be performed by levers and links incorporated into the stock feed mechanism, or by an air cylinder and push rods.

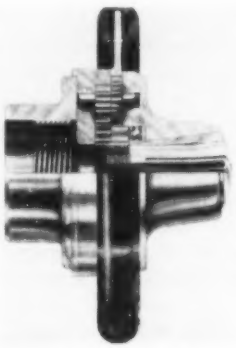
A major disadvantage of the draw-tube type of closer is that it reduces the opening in the machine spindle, and thus the capacity of the machine. This difficulty can be overcome by a special type of collet chuck which fits on the spindle nose of the machine. A handwheel, concentric with the chuck body, may be turned with virtually no effort to open or to close the collet. For even faster operation, lever-operated chucks are available, some of which are adjustable as to the amount of pressure applied to the work.

Another type of collet chuck is operated by a regular chuck wrench, a pinion and gear on a threaded nut moving the collet backward or forward.

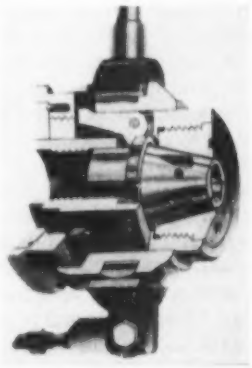
MAGNETIC CHUCKS

DEVELOPMENT of the magnetic chuck represents a major step in the field of work holding, and while it is not new, there have been recent improvements in holding power that have produced increased interest in it.

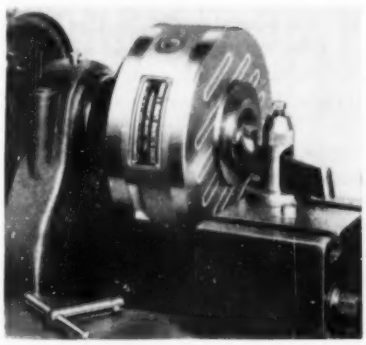
Large rotary magnetic chucks are standard equipment on several rotary surface grinders, and this application, plus the standard stationary unit, represents by far the most common use. However, there are many applications on lathes and grinders where such chucks can be used to advantage. Parts which cannot be held in the jaws of ordinary chucks without distortion are readily held and centralized on magnetic chucks. Thin pieces, and such items as plastic moldings with steel inserts can be held for grinding or for light lathe cuts without the usual difficulties

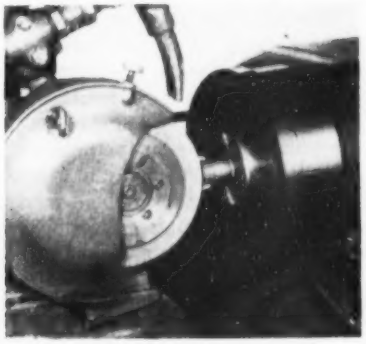


← **HANDWHEEL** operation and gear mechanism combine for fast and easy opening and closing of collets in this spindle-nose-mounted collet chuck

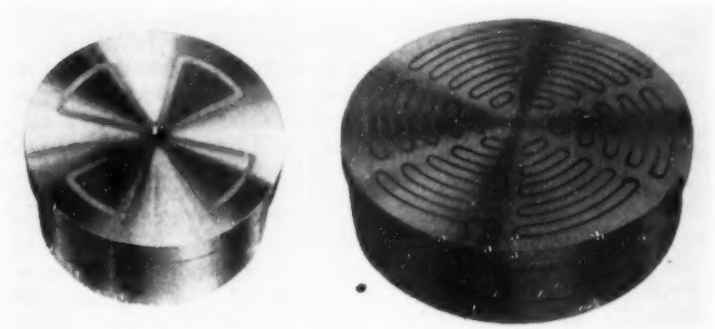


LEVER-OPERATED collet chuck can be operated by hand or air cylinder. Adjusting ring at back permits varying gripping pressure to suit nature of work →





HOLDING POWER of magnetic chucks can be judged by these turning and grinding operations



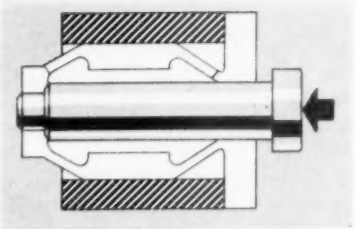
ELECTROMAGNETIC CHUCKS require dc power source, have various pole patterns depending on manufacturer, size, and holding power

PERMANENT MAGNET chucks require no power source. Grip is released by changing position of magnets with key. This style has recessed face to allow tool or wheel to pass through work

inherent in other clamping methods.

Centering can be by means of a suitable plug inserted into a hole provided in the chuck. If this is not practicable, the work may be roughly centered by eye, then, with power reduced, tapped into position and checked with a dial indicator.

Both permanent magnet and power-operated types are available, but it should be noted that dc voltage is required for the latter, so suitable rectifiers must be provided. Both types are completely waterproof and may be used for either wet or dry operations. Standard models are furnished with plain, flat face, but special types can be made with built-in locators or with recessed faces to permit passage of an internal grinding wheel through the work.



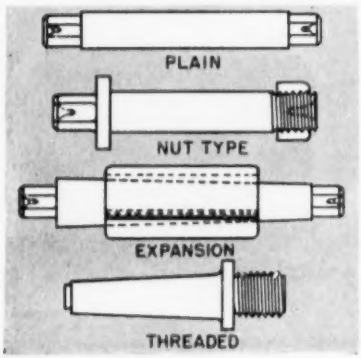
DIAPHRAGM PRINCIPLE is employed in this expansion mandrel in which a slotted steel "bubble" is elongated and contracted by end pressure, grips work when pressure is relieved

PLAIN AND EXPANSION MANDRELS

ALTHOUGH chucks are frequently employed for holding work on the ID, they are not practicable when the length of the work greatly exceeds the length of the bite on the jaw. For such work, a mandrel is usually preferred. In its simplest form, a mandrel is a hardened and ground shaft, with accurately centered ends, and is slightly tapered, usually 0.006 in. per ft. A flat is provided at one end for a driving dog. The smaller end is inserted into the hole in the work and pressed in until it binds tightly.

This type has several disadvantages, notably: A separate mandrel must be provided for each different size of hole; endwise location of the work is not possible; there is considerable wear on the mandrel, so frequent replacement is necessary; and there may be serious danger of distorting the work when inserting or removing the mandrel.

When using this type, be sure to press the mandrel in square with the work, and oil the surfaces so the parts can be disassembled without trouble. When driving the mandrel out, be sure to drive it in the opposite direction from that in which it entered.

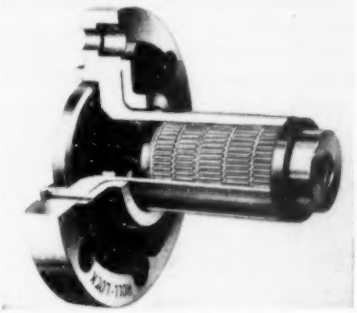


MANDRELS represent a convenient way of holding work having a central hole

To overcome these difficulties, a plain mandrel may be employed with a shoulder to locate the work, and a nut to apply end pressure, or an expansion mandrel may be used. This has a split sleeve to permit its adapting itself to a fairly wide range of sizes, and may be expanded by driving in a tapered section, or by adjusting a screw or nut.

For production work, mandrels may be expanded by a push or pull rod operated by hand or power. One interesting type employs the diaphragm principle. The mandrel is designed as a slotted, hollow "bubble" which may be elongated by a pushrod. This reduces the diameter to provide loading clearance. When stretching pressure is released, the diaphragm becomes shorter and larger in diameter, thus gripping the work firmly and centering it automatically. Several variations of this type are available, either manually or power operated, and using either tension or compression.

In yet another type, the gripping portion of the mandrel has a series of slots through its wall and around its perimeter which permit an expansion of approximately 0.020 in. This gives it full 360° contact with the work. Expansion is accomplished by drawing a central cone through a mass of steel balls contained in the gripping shell. The action is similar to hydraulic action, in that pressure is distributed uniformly around the wall. The mandrel will thus conform to the shape of the workpiece hole, and it is possible to repeatedly center work within 0.0002 in. The mandrel may be used alone or incorporated into a special chuck. Operation may be by air cylinder or by nut or cam.



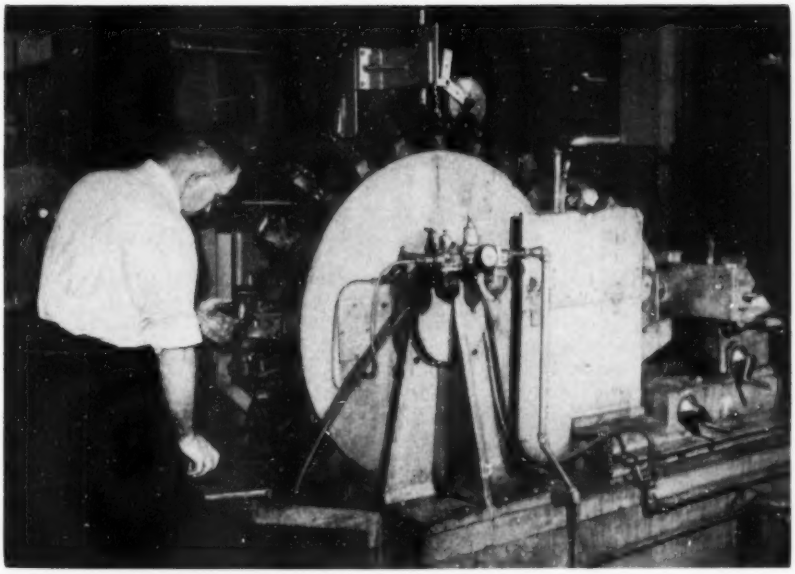
EXPANSION MANDREL functions by means of helically disposed rollers setting up wedging action in tapered ID of body

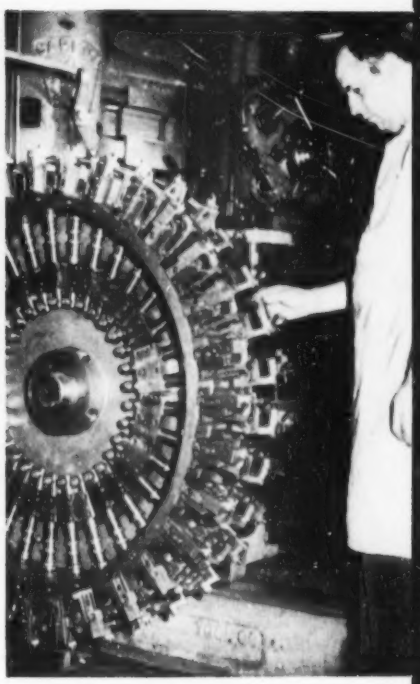
Another unusual type, capable of being mounted between centers, and either in or on the spindle nose, operates by means of a series of helically disposed rollers. Turning an actuating cone on the end of the mandrel forces the rollers backward, setting up a powerful wedging action between the actuating cone and the tapered ID of the body, expanding the latter and gripping the work tightly.

Some types of collet chucks can also be equipped with an expansion mandrel and operated by a pushrod from the regular collet closing mechanism.

We acknowledge . . .

with sincere appreciation the cooperation of the many manufacturers of workholding devices whose generosity in supplying data and illustrations has made this report possible.





ROCKER-ARM GRINDER is a Taylor-Thompson machine fixtured to carry 64 parts, 32 on each side of the plate. Operator loads continuously; clamps are positively set by roller at top of plate. Ejection is automatic under grinding wheel

Dodge doubles up grinding on rocker-arm pads

Two special Taylor-Thompson grinders produce the compound-curved contours on rocker-arm wear pads for 2400 engines per day

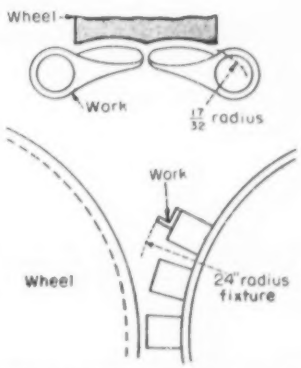
Compared to some transfer machines, 64 fixtures on a single machine is not a record; but it is a surprising number for equipment as small as four grinders working at the Dodge Main Plant.

All the rocker arms for Dodge engines go through this stage of production. The malleable-iron rocker arms are rough-milled to shape, leaving from 0.008 to 0.010 in. of grinding stock for finishing. Then they are brought to the four grinders, loaded by operators, and ground to final shape.

The compound curved contour has a 24-in. radius in the axial plane and a 17/32-in. radius at a right angle to the axis, assuring a good contact in the center of the valve-stem end.

Grinding of this compound curve is necessary so the pad of the rocker arm will present a smooth surface for minimum wear as it moves up and down with its crankarm action. The radius parallel to the bore is 24 in., and is attained by each fixture holding the rocker-arm pad at that radius from the center of the fixture plate. A double-formed wheel, automatically dressed to create 17/32-in. radii, handles the radius perpendicular to the bore of the part.

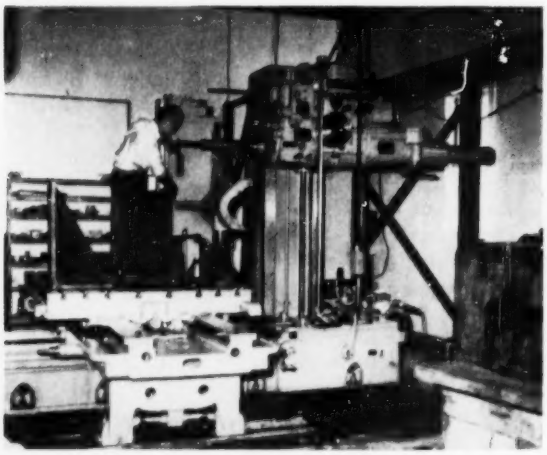
Fixture rotation is at about 15 revolutions per hour, grinding as many as 672 rocker arms per hour.



TWO RADII ARE GROUND; small one by the double-formed wheel, large one because of diameter of fixture plate. Rocker arms on left side of fixture plate are located backwards in relation to those on right, but this has no effect on radii

LOOKING LIKE AN OLD RED BARN, this warehouse for automobiles was built 30 years ago or more. Now, with an extension on the back of the same style, the building houses the largest machine tools within 150 miles. Included are a Cincinnati 4 x 12-ft planer, a 54-in. Niles vertical turret lathe, others pictured here, a 36-in. Norton grinder, and a 17-in. x 6-ft American radial

BORROWED FROM THE NAVY, as was the larger radial, this G & L horizontal boring, drilling, and milling machine was so big the back of the building had to be cut through to get it in. It has a 5-in. spindle, is in the center bay to get necessary height. It is served by hand crane



THIS 4-IN.-SPINDLE G & L boring machine is in the extension, and is a brand-new addition. It is making parts for the Bryant 60-in. swing chucking grinder and the special grinder for 150-mm. gun powder chambers *Photos by Howard L Rich, Jr*

ANOTHER NEW UNIT in the extension is this American 15-in. radial with 6-ft arm. Hand hoists on a rail handle work in and out. Other units include a Hendey and a W & S vertical miller, a 16-in. Fitchburg lathe, a 4-spindle drill, a W & S turret lathe, Woodward & Powell 2 x 6-ft planer, and a 6-in. foot-powered lathe so old museums are bidding for it

RED BARN + BIG TOOLS = NEW SHOP

A year ago October, R L Jacobs borrowed some machines from the Navy, financed others through GSA, to build the Jacobs Machine Works in Charlestown, NH, across the river from Springfield, Vt. He provided large equipment not otherwise available nearer than Quincy, Mass., now subcontracts for Bryant, J & L, and others. He has 19 machine tools and 12 men, plus foreman and office girl, is doing a humming business by filling a special need

ROUND TABLE

Super Salesman?

"One of these days, Al . . ."

"Now what, Ed?"

"It's that so-called engineering salesman that comes around from Garbath Grinding Wheels. The guy just won't stick to his—or rather, to *my*—business. He keeps putting bugs in the ears of my men. Everytime he's in here he goes around, when he thinks I'm not looking, and tells the guys a lot of stuff about what's wrong with everybody else's grinding wheels."

"Well, that's not so good. Is what he says true?"

"Maybe some of it is, Al, but no product is perfect."

"Yeah, that's right. There's probably something wrong with his stuff too, when you get down to it."

"Just try to tell the men that."

"What's the matter, Ed? Losing your grip on the men?"

"I can handle 'em, but I can't afford to hand out cigarette lighters and matches to the men every time I want to tell them about grinding wheels."

"Hmmm . . . What are you going to do, Ed? Keep salesmen out altogether?"

"Hell, yes. Let 'em talk to me in my office. That's my business. Besides, I won't be so impressed with a lot of trash the guy hands out."

"Now wait a minute, Ed!"

"What's wrong with that?"

"You know well enough, Ed. Salesmen can do a lot of good when they come out onto the plant floor. They've got ideas on how to use their product that we'd never think of. You're getting the brains of maybe dozens of plants all rolled up in one guy."

"Yeah. The high pressure, too."

"Besides, the guy deserves a break. You've prob'ly seen places that buy the wrong grade of wheel for the job, stick it in some old clinker of a machine, and the next time the salesman comes around, they tell him his stuff's no good. Maybe it's the best wheel on the market, but they'll never know."

"But why can't they stick to their business?"

"You can't blame them for trying, Ed. Their business is to sell a product, and little tricks of the trade, like free loot every so often, are part of the business. Besides, I just noticed you light *your* cigarette with a suspiciously familiar lighter. I've got one just like it."

"That doesn't make me buy his stuff, Al. I buy on performance, and . . ."

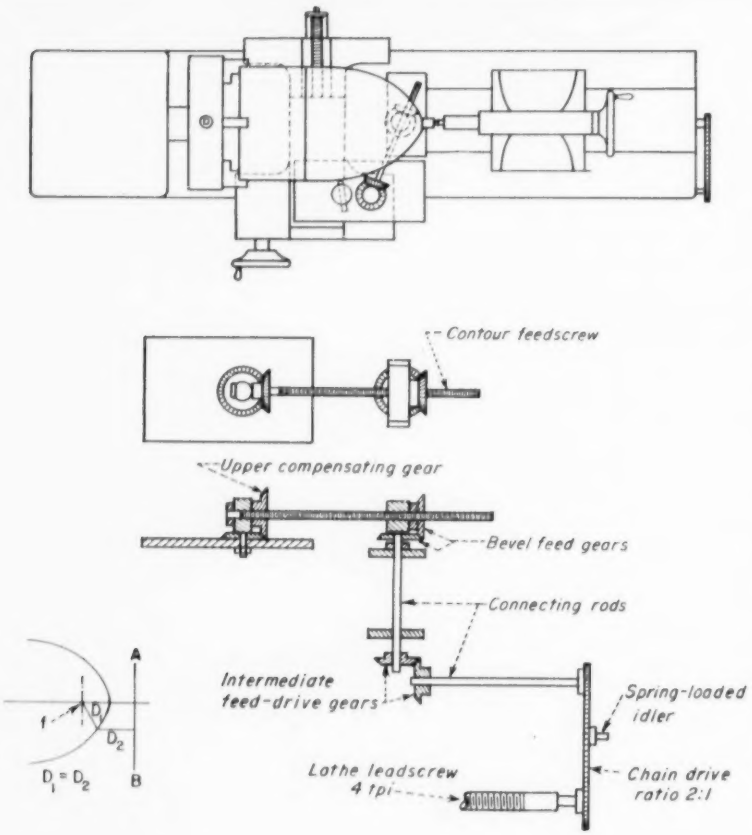
"Sure, sure. . . . So you're better than the men. Maybe they can't tell good from bad?"

"I still say, keep them off the floor."

"You're biting off your nose to spite your face."

WHAT ABOUT ENGINEERING SALESMEN? *Do they have the right (or duty) to go out on the production floor to demonstrate their wares? What do you do when you see what you think are underhanded tactics? Your opinions on this subject may help solve the problem for our readers. Discussions of earlier topics appear on later pages.*

Practical Ideas



Attachment to Engine Lathe Generates Parabolic Spinning Chucks

There are several ways to generate parabolic surfaces, most of which require templets, and are suitable for only one particular parabola. The arrangement shown permits generation of a wide variety of parabolas, such as might be required when making spinning chucks for parabolic reflectors of various sizes and shapes.

DESIGN PRINCIPLES

A parabola is the curve generated by a point moving in a plane so that the point is always equidistant from a fixed point, called the *focus*, and a line, called the *directrix*. Thus, the need was to move a tool parallel to the lathe bed, that is, dimension D_2, and, at the same time, feed the tool toward the focus, distance D_1 maintaining the relationship $D_1 = D_2$. With this principle in mind, the mechanism illustrated was designed.

The compound rest was removed from a lathe, and a heavy plate was fixed on the top of the cross-slide. The cross-feed screw was removed, and a spring was attached to the tool-plate, to force the tool plate against the contour feedscrew. A diamond-point tool was fastened to the tool-plate.

Longitudinal feed came from the leadscrew of the lathe, giving dimension D_2. At the same time, through a series of gears and threaded screws, the tool-block was caused to move at the same rate as the leadscrew, but in a direction toward the focus of the parabola, giving dimension D_1. (The point where the tool would cross the axis of the lathe is the focus of the curve.)

The problem remaining is to drive the contour feedscrew at the same rate of linear travel as the leadscrew. This was accomplished with a chain drive operating through various connecting rods and bevel gears, which resulted in the proper feed rate for the tool. The driveshafts are bolted to the frame of the lathe, and supported in sleeve bearings.

The upper bevel feed gear is threaded internally to serve as a nut on the contour feedscrew. Because the contour feedscrew has 8 tpi, and the lathe leadscrew has only 4 tpi, the chain drive must have a drive-ratio of 2:1.

COMPENSATING FOR ERROR

As the carriage moves, the angle which the contour feedscrew makes with the bed changes. The effect of this is to roll the upper bevel feed gear, causing an additional feeding action which would produce an error in the shape of the parabola. To allow for this error, a compensating bevel gear is secured to the contour feed-screw, and a mating bevel gear is fastened to the tool-plate. As the upper bevel feed gear rolls on the lower feed gear, with the changing angle of drive, the upper compensating bevel gear rolls an equal amount on its stationary mating gear, turning the screw just enough to cancel the effect of the extra travel given the screw by the rolling action of the bevel feed gears.

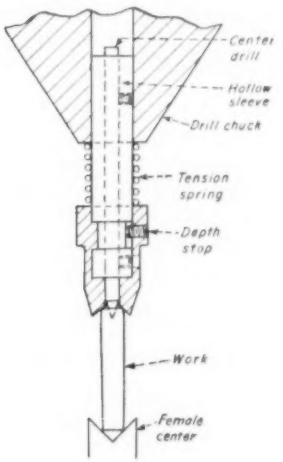
When turning these chucks, the tailstock center supports the work, and the nipple left on the work is filed off by hand. This part of the chuck is not important, because the end of the reflector is cut out after spinning.

To make various shaped parabolas, it is only necessary to change the focal point and correct the initial length of the contour feedscrew. *Clifford Molloy, Bronx, NY*

Inverted Cone Guides Centering Tool in Drillpress

Center-drilling squared-off bar stock or bosses on forgings is accomplished with this tool, which consists of a sleeve, the bottom of which is an inverted cone. Inside this sleeve is a hollow cylindrical shaft which is held in the Jacobs chuck of a drill press. The center-drill is held in place within this hollow sleeve, by two setscrews. A heavy compression spring outside the hollow shaft rides against the drill chuck, keeping the inverted cone pressed firmly against the work. Several slots are cut into the cone, for chip removal.

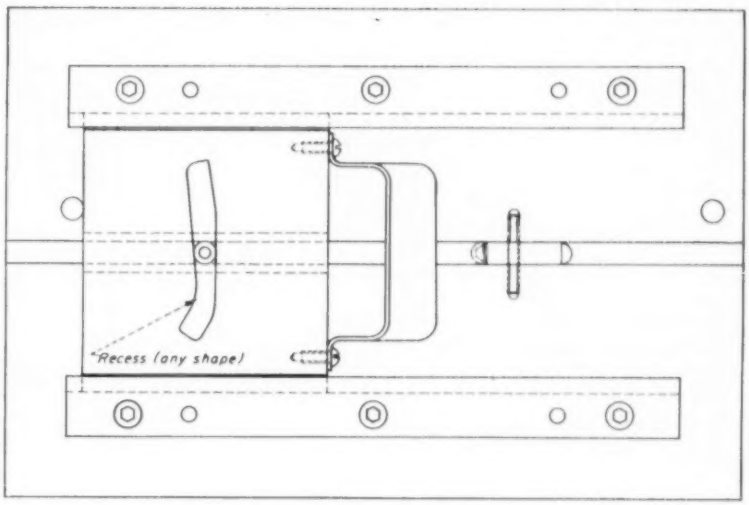
As the drill is lowered to the work, the inverted cone comes into contact with the squared end of the work. Further travel of the drill increases the pressure (and friction) of the cone, which holds the work from rotating, and, as the drill is lowered, cutting begins. When the proper depth is reached,



the lower edge of the hollow shaft is stopped by a setscrew.

Depth adjustment is made by sliding the drill up or down in the hollow shaft, fastening it in place with two setscrews.

Spring compression is determined by the depth to which the hollow shaft is pushed into the drill chuck. *N Palmer, Paddington, Australia*

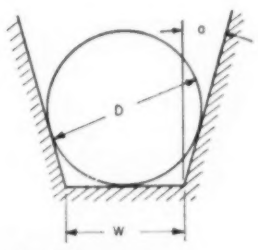


Flipper Ejects Flat Parts From Shallow Die Recess

When blanks are tight in a die after the necessary operation has been performed, this flipper kicks the parts out of the die. In this particular die, a lever arm is flattened, and trouble was experienced removing the parts, until the flipper device was incorporated.

The work is put in place and the die is slid under a guard and the punch. When the operation is finished, the die is pulled back across the flipper, which strikes a spring-loaded knockout pin. The pin kicks the part out of the die.

When returning the die to its place under the punch, the knockout pin rides over the flipper, which rotates on a hardened pin. *Lester J Peck, Manitowoc, Wis*



Formula Measures Thread-Groove Width

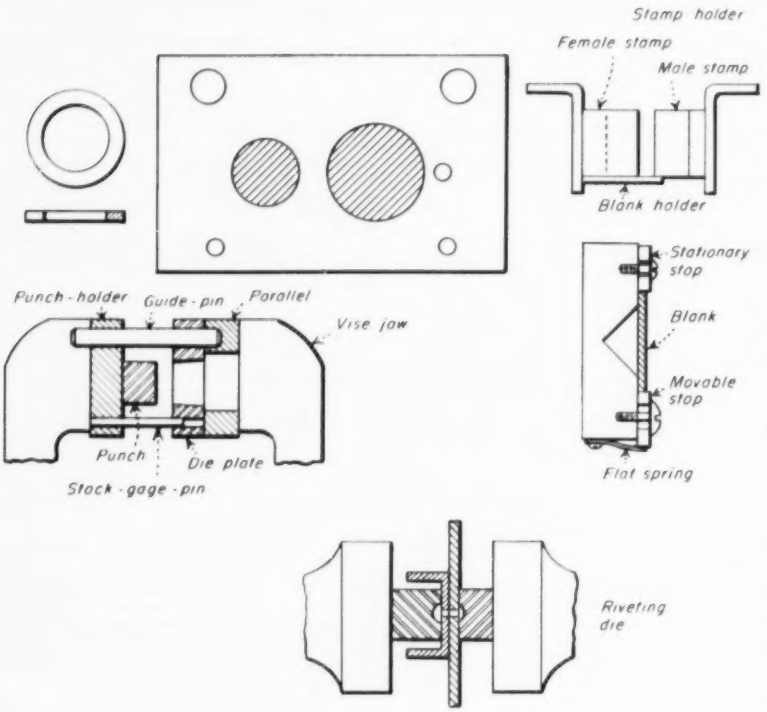
We recently had occasion to measure a small thread-groove with angular sides and a flat bottom (similar to an Acme thread).

The known dimension was the width of the flat at the bottom, and we wanted to know the proper radius for setting a wheel dresser to grind this groove, and the correct wire size for checking.

To solve the problem, we worked out this simple formula:

$D = W (\tan a + \sec a)$

This may not be new, but we found no help in our handbooks. *M G Terrill, Worcester, Mass*



Bench Vise Serves As Simple Emergency Screw Press

A strong, well-guided machinist's vise may sometimes successfully replace a small press. Indeed, a vise is essentially a small screw press, so a vise can be used satisfactorily for the production of stampings. Of course, a vise has limitations in press work; it will make only small stampings (which require only a fraction of a ton for the operation), and only small quantities, because of the slowness of the device. Also, only simple operations can be performed, because of the smallness of the jaws. Finally, the tolerances must be ample, because only comparatively rough, simple tools can be used.

However, the bench vise is excellent for small run, experimental jobs, when only a few dozen (or a few hundred) small samples are to be made in a hurry.

Almost all the basic press operations can be done in a vise—among them, blanking and piercing, bending and forming, pressing, riveting, assembling, and staking. Drawing is not usually recommended, because of the difficulty of arranging the proper blank-holder. Even shallow cups can be drawn, though, if the conditions (properties of the stock, proportions of shell height, shell diameter, and stock thickness) permit drawing without the need of blank-holding equipment.

Of course, the dies, being temporary tools of an emergency nature, are reduced to their utmost simplicity, both in design and construction.

The cutting members are made from just sufficiently suited material: unhardened cold-rolled steel for soft stock; case-hardened machine steel or hardened tool steel for hard stock.

The accompanying drawings show a few examples of such emergency dies, made for a bench vise.

Gasket washers are produced by the two-station progressive piercing and blanking die. The die is composed of a die-plate, punch-holder with two punches, two guide pins, and two stock gages—in this case, simply two pins.

There is no stripper; strip is removed from the punches by a fork-shaped tool put between strip and punch-holder before the cutting action (closing of the vise).

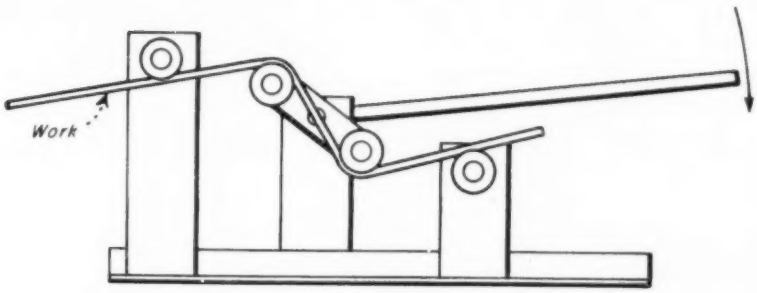
A "V"-bending die is another popular tool for such cases. The two stamps—male and female—are held by two false jaws. The alignment between stamp-holders is insured by guide pins (not shown).

The stop of the bending die has an interesting feature. To avoid shifting and/or falling down of the blanks to be bent, one of the strips is made self-adjusting—that is, it is spring-actuated, so the blank is continually pushed against the stationary stop. As soon as the male stamp (the punch) contacts the blank, and bending action begins, the blank easily leaves the stop nest.

Also shown is a riveting die, very successful in a vise, for assembling a formed metal stamping to a flat blank. *Federico Strasser, Santiago, Chile*

Cutting Screwthreads Without Compound Slide

When cutting screwthreads in a lathe not equipped with a compound slide-rest, with the work driven by a driving dog, make a pencil line on the work at the center of the dog pin. To make successive cuts, move the work radially forward or backward approximately 1/16 in. Finish the cut with lines opposite the starting point. This will have the same effect as a compound slide, by causing the tool to cut on both sides of the screw flank. *R T Spinks, Belfast, N Ireland*



Multiple-Bending Fixture Simplifies Electrical Wiring

We recently had to do quite a bit of electrical wiring, which, because much of it was for shop purposes, had to be enclosed in tubular conduit. We found, when we started to put up the wiring, that the usual tool for bending conduit to house this wiring makes one bend at a time, but every time a conduit goes up or down—to go over or under an obstruction—a double, or offset, bend is required. An offset bend is also required almost every time a conduit enters a switch box.

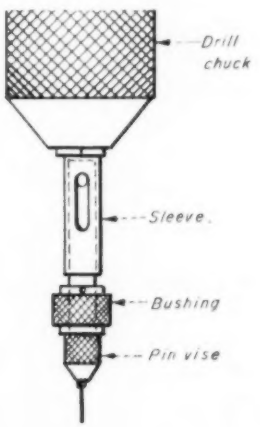
To achieve this result, we built a bending jig which produces an offset bend directly. The unit consists of a "T" iron base with 3 uprights. The end uprights carry grooved rollers, and the center upright carries a pin, to which a plate with two rollers is attached. A lever attached to this plate provides bending force.

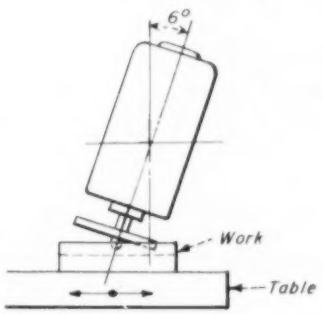
Conduit bent on this device has an offset with parallel sections on either side of the bends. *H G Koslow, Bronx, NY*

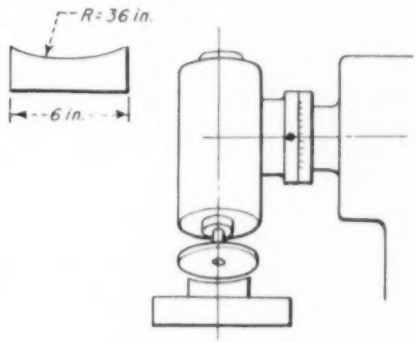
Drill Tiny Holes Without Sensitive Drill

Simple alterations to a pin vise will help improvise an inexpensive sensitive drill. Slip-fit a knurled bushing near the grip-end of the pin vise, and attach a slotted sleeve to the other end of the vise.

Drill a hole near the upper end of the pin vise to line up with the slot, and insert a pin into this hole. When the sleeve is held in a drill chuck, the pin will drive the pin vise. By holding the bushing, the pin vise can be moved up or down. *Ottavio Cerullo, East Boston, Mass*







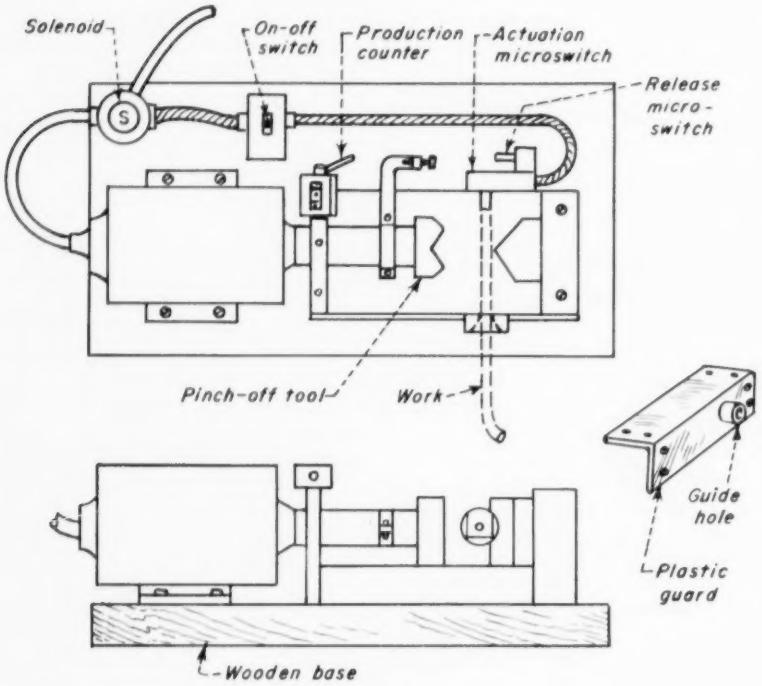
Standard Milling Cutters Form Large Radii

It is occasionally necessary to mill a large radius on a small surface, but a suitable milling cutter is not available. For example, in our shop, we had to mill a 36-in. radius on a block which was only 2x2x6 in. We tried to produce this cut on a horizontal milling machine, changing the height slowly by hand and following a templet with a dial indicator. Unfortunately the resulting surface was uneven and wavy, so we were forced to find some other method.

We then thought of another, more satisfactory, way to make the cut. On a vertical milling machine, we mounted an 8-in.-dia flycutter, and inclined the head at 6° from vertical. This arrangement produced the desired radius, within the tolerance we were allowed.

It is true that the curved surface is an ellipse, but, with such a large radius, the error is small, hence this method often works out well.

A shell mill applied in the same way will produce a very satisfactory cambered groove. *Walter Pfeiffer, Ontario, Canada*



MicroSwitches and Air Pinch Off Tubing

In one of our sub-assemblies we have a small piece of capillary tubing which has to be crimped off to be made water-tight. We tried standard methods of sealing off the tube but some leaky tubes resulted, so we made this fixture, which not only solved the problem of leaks, but also saved us quite a bit of time. The operation is relatively simple, and can be performed by an unskilled operator.

Capillary tubing is placed through the guide hole in the plastic guard. The end of the tubing presses against a MicroSwitch button, causing a solenoid to open. Air pressure is thus built up in the air cylinder, moving the pinch-off tool forward, to shear off and seal the end of the tubing. A small arm attached to the ram of the pinch-off tool is adjusted so that, when the pinch is completed, this arm trips a second MicroSwitch. This MicroSwitch causes a second solenoid to close off the air pressure, and the ram returns to its original position. The processed tubing is then removed from the fixture, and the cycle is complete. *Arthur Nelson, Minneapolis, Minn*

Turnbuckle "Beefs Up" Small Drillpress

We noticed that our small, light-duty drillpresses couldn't hold dimensions on especially fussy holes, but, upon checking, found that we couldn't clamp the table tight enough to prevent a small amount of flexing under normal drilling load. Therefore, we made a clamping ring, in two halves, to clamp around the drillpress column, and a bracket, which was attached to the drillpress table. Between these two clamps we mounted a turnbuckle, which can be tightened or loosened to zero the table. The clamp on the column of the drillpress can be released to raise or lower the table. *Salvatore Architetto, (no address given)*

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Aug 17, 1953

Allen Clarke

Rochdale, England

Milling Attachment Bores Holes

for the best PRACTIAL IDEA

An extra payment of $25 is made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT — $25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES — A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

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WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER — Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42d St., New York 36, N. Y.

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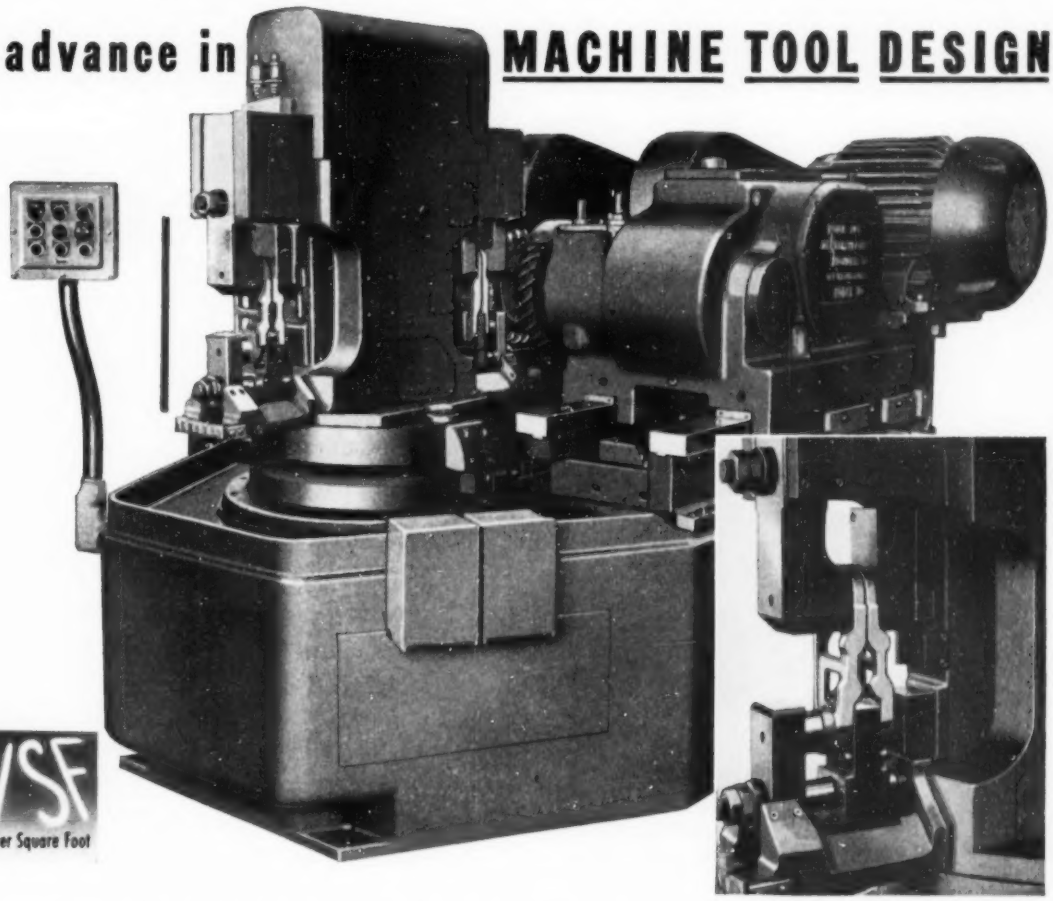


MP/SF
Most Production per Square Foot

Each machine tool built by us is charged with doing a specific job better than before and for less. To us that is a privilege—a challenge—an obligation. Every machine developed by the Motch & Merryweather engineering staff must earn a permanent place for itself in Industry—must contribute permanently to a nation's advance in point of efficiency and economy—must mark a visible step forward in machine tool design and construction . . . An example is outlined on this page.

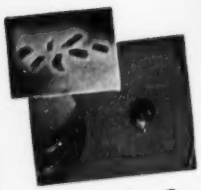
This M & M duplex production single-purpose milling machine mills two tractor side bars while two others are being loaded (removing at same station). Actually mills 70% of the time; up to 268 side bars per hour @ 100%. Two heads move, not the operator. Rigidity and power (30 h.p.) hike output. Fixtures to suit.

Manufactured by — THE MOTCH & MERRYWEATHER MACHINERY CO. —
CLEVELAND 13, OHIO
Builders of Circular Sawing Equipment, Production Milling, Turning and Special Machines

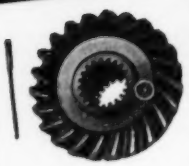
PRODUCTION-WITH-ACCURACY MACHINES AND EQUIPMENT

METAL DISINTEGRATION

and what it can do for you . . .

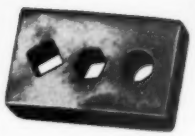


Remove Broken Taps fast without distortion

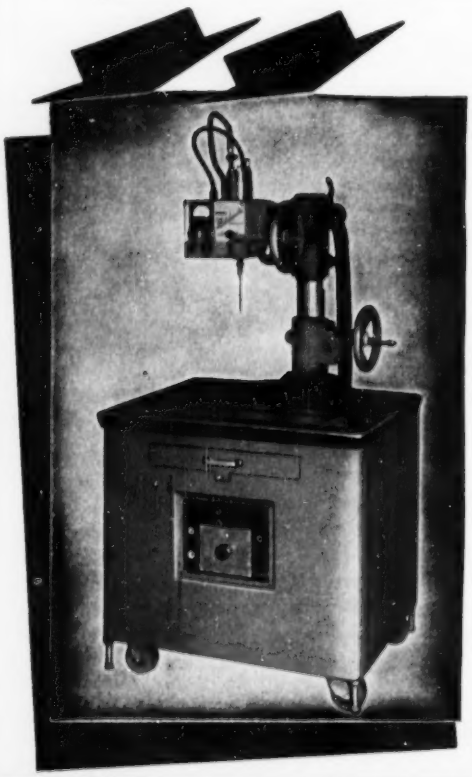


Cut oil holes in hardened gears without annealing

Cut dovetails in hardened dies



Cut any shape hole in cemented carbides



Literally hundreds of thousands of dollars are saved annually by corporations that are using Metalmasters in just tool and die repair alone.

There's a technical engineer in your area to give you an on-the-spot demonstration in your own plant at your convenience. (NOTE: It is not uncommon to pay for a Metalmaster with just one short demonstration thru savings on workpieces.)

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DIVISION OF CLINTON MACHINE COMPANY

CLINTON, MICHIGAN

American Machinist REFERENCE BOOK SHEET

Broach Troubleshooting...I

By JOSEPH R PSENKA, Field Engineer
NATIONAL BROACH & MACHINE CO

Maximum productivity of smooth finish, close-tolerance parts by the broaching process can be easily achieved if adequate attention is paid to the design, operation and maintenance of the broaching machine, the broaching fixture and the broach. The metallurgical and dimensional condition of the part when it reaches the broaching operation is the other critical factor in obtaining maximum broached-work output and quality.

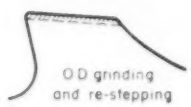
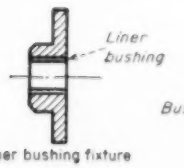
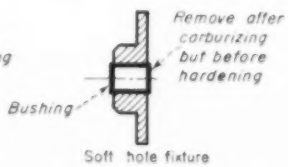
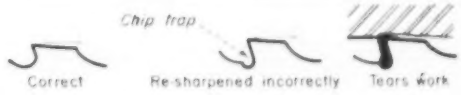
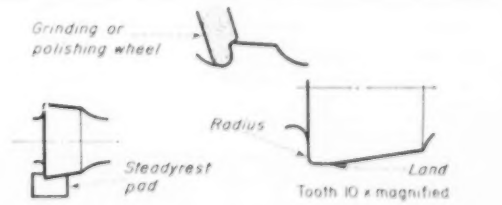
Broach troubleshooting is simply the isolation of the cause of a faulty condition and correcting it. When troubles arise, first inspect the part and analyze the broached surface. Then visually inspect the broach for chipped teeth, metal pickup or any of the other trouble sources listed below.

If the trouble still is not located, the part can be placed on the front pilot of the broach and both part and broach marked to indicate relative radial location. Next broach the part or several parts. If the fault in the broach surface appears each time in definite relationship to the marks on the part and broach, the broach is probably the trouble spot. However, it should be remembered that the broach is only one of four possible trouble sources.

The following check list is broken down into eight common broaching troubles. Once the broach trouble is known, the various causes can be systematically eliminated and the faulty condition corrected. This check list applies to all types of broaches, including round, spline, serration, square, hexagon and special form types, as well as slab-type surface broaches.

CHECK SHEET FOR CAUSES AND CURES FOR BROACHING TROUBLES

PART GALLING AND PICKUP

CAUSE	CURE
	
1. Broach teeth damaged	Repair mutilated teeth by: (1) heavy face grind, or (2) send to supplier for OD grind and restepping. Check handling and setup practices. Use follower supports if needed.
 	
2. Hard fixtures or liner bushings	Use soft (Rockwell C 30-35) liner bushings or soft-hole fixtures. On a carburized and hardened bushing or fixture, the hole can be bored after carburizing to remove the hardening agent before hardening the piece, and thus produce the desired "soft hole" in the hardened part.
3. Improper face angle	Check sharpening practice, broach print and broach design.
4. Negative rake	Check face angle radius on grinding wheel.
	
5. Deep or shallow face-angle radius	Check sharpening practice and broach print.
	
6. Rounded cutting edges	Check grinding wheel dressing method. Use bottom of chip space instead of broach OD for steadyrest support.

Wickman

TAPPING ATTACHMENTS

for turret lathes

Eliminate COSTLY TAP BREAKAGE

This tapping attachment is designed specifically for turret lathe use. It is considerably shorter than the well-known Wickman Tappers Model T and Wickman Combination Tappers Model TS, and incorporates the same exclusive design features, allowing for presetting the tapping torque required for any tap size or material. They also afford the same well-proven and unfailing safety features, preventing tap breakage in blind hole tapping or materials difficult to tap.

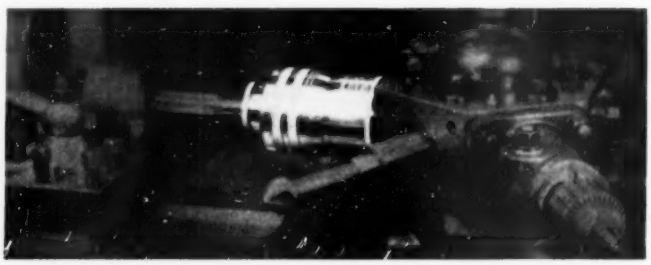
MODELS AVAILABLE

MODEL	RANGE*	SHANK		LENGTH	DIA.
		Dia.	Length	Overall	Max.
T-2-S	3/8" to 1"	1 1/2"	3 1/16"	8 9/16"	3 7/16"
T-3-S	5/16" to 1/2"	1"	2 1/2"	6 7/8"	3 1/16"

**Quick change tap adaptors included with attachment.*

In addition, WICKMAN Tapping Attachments:

- Use economical hand taps
- Faultlessly tap blind holes
- Fit directly into the turret socket
- Are simple to operate and easy to maintain
- Assure consistent accuracy
- Are dependable—guaranteed for 12 months



THE Wickman MANUFACTURING CO.

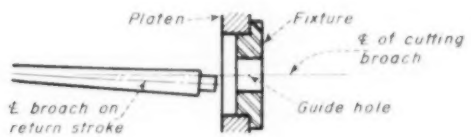
10325 CAPITAL AVENUE
OAK PARK (Detroit 37), MICH.

Broach Troubleshooting...II

CAUSE	CURE
7. Cutting edge burned	Check for loading of grinding wheel.
8. Dull broach	Sharpen broach.

BROACH BREAKAGE

1. Broach overloaded	Broach only parts with lengths of cut for which broach is designed.
2. Broach dull	Keep broaches sharp. Pull loads are tremendously increased by dull abraded broaches.
3. Interrupted cutting stroke	Avoid stopping and starting broach in middle of cut.
4. Backing broach through part	Remove parts from broaching machines before the broach returns to cutting position.

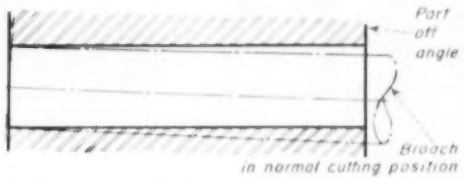


5. Broach passes completely through guide hole	Set stops on machine so broach remains in fixture guide hole at end of stroke.
6. Dropping the broach	Handle broaches with care.
7. Loose-fitting or sharp-edged key (Key-type pull ends on broach)	Fit key snug and round the edges.
8. Crooked holes in part	Check forging or drilling operations.
9. Off-square locating surfaces	Avoid overloads by providing accurate work and fixture location surfaces.
10. Hard holes in parts	Check hardening processes to assure parts broached after hardening have machineable holes. Correct machining practices that work-harden surfaces.
11. Insufficient back-off angle	Compare back-off angle with broach-print specifications.

CAUSE	CURE
Sharp corners on pull end	
12. Sharp corners on broach pull end	Make certain corners of broach pull end are filleted.

BROACH DRIFTING

1. Eccentric face grind	Check runout of centers of broach sharpener. Clean centers of broach.



2. Inadequate broach or part support	Provide adequate supporting means for heavy broaches and parts on horizontal broaching machines. Be certain part and fixture are square.
3. Small broach body	Specify broaches with body diameters that assure adequate stiffness.
4. Unsymmetrical cuts	Correct part processing methods to provide needed concentricities.
5. Variable part hardness	Correct forging, casting or hardening processes.
6. Too few broach teeth in contact	Check broach design.
7. Non-uniform dullness of broach	Sharpen broach. Check parts and coolant practice.
8. Machine misaligned	Check machine and fixture with master alignment bar.

RINGS IN BROACHED HOLE

1. Surging broach feed due to uniform pitch	Specify broaches with differential tooth spacing or shear cutting teeth.
2. Broach excessively sharp	Remove sharpening burrs with a wood block.

HANDLE ALL YOUR EMULSIFYING CUTTING OIL NEEDS with S.E.C.O. and S.E.C.O. HD "F"

Sunoco Emulsifying Cutting Oil — For general-purpose cutting and grinding. This product is more widely used in metal-working plants than any similar oil. It has high emulsion stability and cooling efficiency, excellent lubricating and rustproofing characteristics. Those features, plus low initial cost, make S.E.C.O. ideal for a wide range of machining, grinding and rolling operations on both ferrous and nonferrous metals.

Sunoco Emulsifying Cutting Oil HD "F" — For heavy duty cutting. Its extreme pressure properties give it a film strength more than twice that of regular emulsifying oils. This high film strength, plus increased "oiliness" characteristics, makes it ideal for machining jobs too tough for regular soluble oils and too hot for straight cutting oils. Emulsions of S.E.C.O. HD "F" are clean smelling and will remain so in service.

For complete data on S.E.C.O. and S.E.C.O. HD "F," call your nearest Sun office or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. AM-10

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SUNOCO

Broach Troubleshooting...III

CAUSE	CURE
3. High backoff angle	Check broach design.
4. Rough part-location face	Provide square locating face on part or use equalizing type broach fixture.
5. Unsupported broach or part on horizontal machines	Provide support until the last cutting tooth is through the work.

CHATTER

1. Too few teeth in simultaneous cutting contact	Change broach design. Specify shear cutting teeth or alter face and rake angle.
2. Excessive part hardness	Correct hardening practices.
3. Poor fixture design	Design fixtures so that parts are held in firm position during broaching.
4. Surging of ram	Reduce or increase broaching speed. Check hydraulic system.

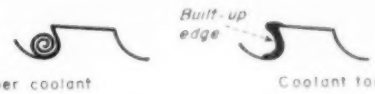
STUCK BROACH

1. Insufficient machine capacity	Provide broaching machines having adequate capacities for specific operations.
2. Dull teeth	Sharpen dull broaches.
3. Clogged chip gullets	Check sharpening or chip breaker practices.

9. Insufficient backoff	Check with broach supplier.

10. Incorrectly ground chip breakers	Set centerline of V-shaped rubber-bond grinding wheel as far back as possible behind broach cutting edge, when grinding chip-breaker notches.

CAUSE	CURE



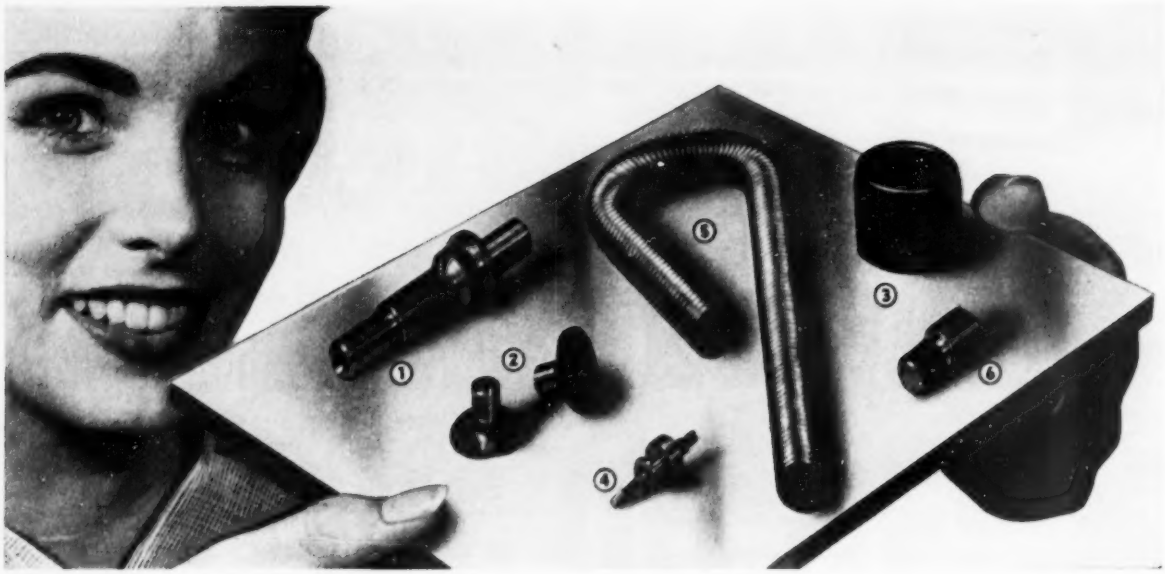
11. Coolant	Use recommended coolant. Check for leaks of hydraulic oil into coolant.
12. Porous forgings	Check forging practices.
13. Inclusions damaging cutting edges	Use material with high standard of cleanliness. Micro-examine material for slag and other foreign material.
14. Structure of material	Check microstructure. Avoid spheroidal structure if possible. Lamellar pearlitic structures are desirable.

STREAKS IN PARTS

1. Metal pickup on lands	Lands too wide for degree of part softness; check broach design.
2. Face grinding burrs	Remove with hardwood block or broach cast-iron blanks.
3. Abrasive or shot-blast material on parts	Pickle forgings. Alter part processing sequence.
4. Scale in coolant	Pickle forgings. Install filter or magnetic chip separators.
5. Excessive scale on parts	Pickle forgings. Specify broaches designed for the condition.

ABRASION OF BROACH SURFACES

1. Excessive scale	Pickle forgings. Specify broaches designed for the condition.
2. Improper coolant practice	Remove scale in suspension by installing a filter.
3. Cold worked surfaces	Check micro-hardness of parts. Change processing methods if necessary. Specify broaches designed for this condition.
4. Broach condition	Check broach hardness and face-angle sharpening.



Lead Lubricating Steel

increases production 43%

It is almost too good to be true—but, in Ledloy, lead actually lubricates the steel during machining, permitting greatly increased feeds and speeds. On job after job in shops throughout the country Ledloy is effecting net savings of 25% or more because it machines 30% to 50% faster than B-1113 and extends tool life as much as 200%.

The lead in this remarkable open hearth steel is so finely dispersed it cannot be seen with a microscope. Yet it reduces the friction between chip and cutting tool substantially. And Ledloy machines to an unusually clean smooth finish—case hardens effectively—bends, crimps, swedges or rivets easily.

Your nearby Ryerson plant now has large stocks of Ledloy rounds, squares and hexagons in a wide range of sizes. So get all the facts from your Ryerson representative or write for engineering data on Ledloy. And call Ryerson for quick shipment of this remarkable new free-machining steel.

How Ledloy Cut Costs on These Parts

1. ***BEATER SHAFT**—production increased 43% when shop switched to Ledloy from C-1117. Part is case hardened to 60-62 Rockwell C.
2. ***GOLF SHOE LUGS**—Ledloy succeeded where free-cutting Bessemer steels failed in this swedging operation. Took inside threads perfectly.
3. ***UNIVERSAL JOINT SOCKET**—formerly made from C-1117, production rose 72% with Ledloy. Part is case hardened to 60-62 Rockwell C.
4. ***DRIVE SHAFT**—result of changing from B-1113 to Ledloy: production increased more than 35%, over-all costs decreased 20%.
5. ***THREADED BAR**—the excellent cold-bending properties of Ledloy important here. Notice clear definition of thread and fine finish.
6. ***KNURLED STUD**—B-1113 originally used. Use of Ledloy resulted in 19.9% reduction in over-all costs, 54% increased in production.

*Company name and more detailed figures on request.

Principal Products: Carbon, Alloy & Stainless Steels—Bars, Structurals, Plates, Sheets, Tubing, Machinery & Tools, Etc.

RYERSON STEEL

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • CINCINNATI • CLEVELAND • DETROIT
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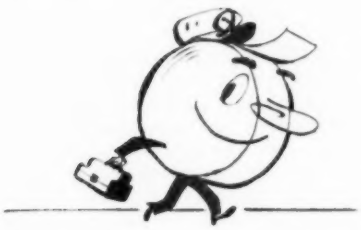
TALKING SHOP



Tape Skinning

MAGNETIC TAPES will probably replace tracer controls for skin millers, according to Edgar L McFerren, vp-Engrg, Giddings & Lewis, in a talk before the Chicago chapter, ASTE. Tracers are not sufficiently accurate for the job, and templets cost too much to design and make. The first step will probably be magnetic-tape memory control, in which the operator machines the first piece, recording machine movements on a tape. Then the tape takes over for subsequent pieces—and can be stored for later use. Next step will be direct production of the tape from machining steps calculated on an electronic computor. Thus tapes could be produced at a central point and distributed.

Potentially, according to Mr McFerren, the aircraft industry may become the biggest machine-tool customer, replacing automotive plants.

Page Mr Fuller

MANUFACTURE of welding electrodes demands scrupulous cleanliness, lest dust get into the coating extrusion dies. Yet the new A O Smith plant in Lancaster, Pa, doesn't have a single broom. Instead, the entire floor space is vacuum-cleaned every 24 hr, and accidental spills are vacuumed immediately.

A slight positive pressure is maintained in the plant to prevent entry of dust. Incoming air is thoroughly cleaned, of course, but even the exhaust air which may have picked up a certain amount of process dust is passed through a wet-type Roto-clone to avoid contaminating the outside atmosphere. So exhaust air is actually cleaner than the air we normally breathe in the cities.

The plant is out in the country, surrounded by some of the finest farm land in the world.

And incidentally, it is so good looking that the owner of the cement-block garage and gas station nearby is talking of refinishing the exterior of his shop to reduce contrast that is to his disadvantage.

165,000 Tools

MODERN JET BOMBERS require 165,000 tools per model, according to tool engineers at Boeing. As a consequence, the company has a manufacturing unit to refine tools and methods. Originally, the setup was used as a snag remover, but now it is doing extensive work in snag prevention, frequently on parts or methods not yet in use. One method of doing this is to set up an interdepartmental panel of experts to study a particular problem, supplementing the unit's own group of specialists. The panel really advises the specialists in their work on a particular problem — answering questions on characteristics of the finished part, ease of inspection, soundness of proposed fabrication procedure, and the like.

In one case, thin-wall tubing was considered, but bending was a problem. A Pines bender was purchased and modified for thin-wall, close-tolerance work under the advice of a panel composed of men representing production planning, inspection, parts fabrication, tool fabrication, equipment engineering, tool coordination, and engineering. Aluminum tubing was bent successfully, so engineering men asked that stainless be tried. Previous methods involved drop-hammer forging of elbows and arc welding into a tube, a procedure that was costly, required new dies for a difference of half a degree in angle, and resulted in considerable scrap. Welding caused bend roughness that interfered with flow. Tubing of wall thicknesses of 0.035 to 0.083 in. had been involved in the aluminum work, but this was half that thick and to tolerances of 15 min. of arc (tubing had to be within 0.030 in. in a 500-ft devious path).

Tests showed the modified bender could do the job, providing a suitable bending compound was used. But ripples were formed in the $5-a-foot tube. The solution proved to be resizing the tube by compressing it in a die. Savings: $14,000 per plane.

Other money-savers include a new standard specimen for checking tensile strength of aluminum-alloy stock, plus a new milling fixture and cutter to make the specimens, estimated to save $100,000; a plastic-faced joggle die, phenolic stretch-form blocks, a minimum-bend radii check, an impact shear to cut radii on photo templets, a special laminated washer with a tab to shim wing terminals. Each unit provided an instruction manual.

Paper Fetish

BUSINESS is adding about 15% a year to records—about 1¼ trillion pieces of paper—says Emmett J Leahy, head of Leahy & Co, New York management consultants. There is now one office worker for each two factory workers, compared with one to four 30 years ago. There are too many copies, too many overlapping filing and recording operations. 40% of the records kept by management are useless and can be destroyed, another 30% can be stored in central archives, and only 30% need be in the office. Costs of paper work are considered as 20 cents to create one letter or other document, a penny a year to keep it in the office. Clerical salaries are now a ninth of the nation's payroll . . . Better look over your own records and systems —but don't *write* a report!

News of Metalworking

Continental Defense Gets Top Priority As US Military Program Takes on a New Look

WASHINGTON — The military program of the United States is again at a turning point. All indications in Washington point to the fact that economy-minded civilian bosses have just about reached the limit in cutting the defense budget. In fact, they'll be lucky if they can keep defense spending down to present levels.

Early this fall, defense procurement officials quietly began plowing back funds saved in earlier whittling of plane contracts. But instead of buying the same types of planes, newer and faster fighters and bombers (such as F-100's and B-52's) are now under contract. The ease-up in Korea helped out the switch. But even so, there's growing sentiment in the Pentagon favor of rapidly beefing up US defenses.

Announcement of the Russian H-bomb explosion further heightened this feeling. And the Joint Chiefs are placing continental defense at the top of the list.

Defense spending, on the downgrade since last year, may turn around and begin an upward climb as additional planes, guided missiles, radar and other electronic devices are ordered for continental defense.

The Military Situation

Administration leaders differ on the danger of Russian attack. Defense Secretary Wilson believes it may be some time — possibly three years—before the Reds possess sufficient quantities of H-bombs and are capable of delivering them. But the Air Force has disclosed that the Reds have activated their first group of intercontinental bombers having range and speeds equal to or exceeding those of the B-36. Chairman Albert Cole of the Joint Congressional Atomic Energy Committee calls the threat of Russian attack "a dire peril."

Constant Red Threat

In any case, the old readiness target date—figured to be 1954 by the former Joint Chiefs—has now been tossed out the window. Current basic premise is that we are operating in a continuing period of danger and that an attack could come at any time. And the $2-billion defense reduction expected to follow the shooting war's end has dwindled to less than $1 billion.

Continental defense was by-passed during the post-Korea buildup period, with the result that now immediate steps have to be taken to increase US defense against A- or H-bomb attack. First steps are shaky but a big long-range program is under discussion.

The Industrial Base

Another problem the new JCS has to face is the shaky industrial base —founded on General Marshall's 1950 premise that increased plant capacity and new production sources can take the place of a larger standing military force. According to new Pentagon thinking, the old broad base idea has served its purpose. But with Soviet ability to deliver a quick, crippling atomic blow to industry, top strategists figure we are leaving ourselves in a much-too-vulnerable position.

New Defense Program

Within this framework, the new Eisenhower military program is shaping up. Earlier this month, the

Ekco Products' Massillon Division Turns

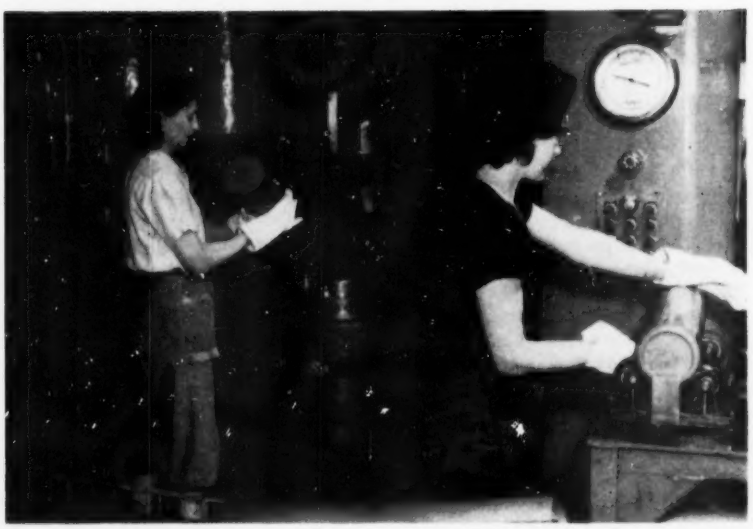
MASSILLON, OHIO—Military and state officials, industrialists and local groups were on hand here September 29 to honor employees of Ekco Products Co's Massillon Division upon completion of the millionth 90-mm shell casing here.

Governor Attends

Attending were Governor Frank J Lausche of Ohio; Brig Gen W E Laidlaw, CG of the Joliet, Ill., Ordnance Ammunition Center; Lt Col B A Saholsky, head of the Cleveland Ordnance District; and other local and state officials. This group was taken on a tour of the plant and was shown operations involved in production of 90-mm and 105-mm cases.

Ordnance Producer Since 1950

Ekco, world's largest producer of housewares and commercial baking pans, has been producing ordnance items since 1950.



THIS 25,000-TON HEADER PRESS is part of Ekco Products Co, Massillon, Ohio, production line which recently turned out its millionth 90 mm shell case

JCS review and recommendations were presented to Secretary Wilson and the National Security Council. Details are highly classified, but it's known that the recommendations carried a costly price tag based on making continental defense the prime military objective over the next two years.

US Radar Fence

Here is what the US needs: a radar fence backed up by fighters, bombers, interceptors, guided missile battalions, anti-aircraft units—stretching clear across North America. This line is already building, with the US paying for two-thirds of it, Canada the rest.

Cost estimates depend on how fast and how far the US wants to go, but if NSC and the President approve of full-scale A- and H-bomb defense, military spending will start climbing next year.

1954 Cost: $43-45 Billion

First-year spending for such a program, including maintenance of present forces, would run $43-$45 billion for fiscal 1954, compared to the old program's $41.7 billion estimate for 1954, and its $37-$38 billion for 1955. Depending on buildup speed, spending might hit $50 billion in 1955.

Along with US defense against atomic attack, top officials are emphasizing protection of industry against bomb damage—and on post-attack reorganization. There's renewed talk about industrial dispersal, building bomb-proof plants and adding bombproofing to existing plants.

Industrial Defense

Government recently okayed five-year amortization of the added cost of bomb-proofing a building. Several companies have applied for this, but only one, Cincinnati Milling Machine Co, has really gone ahead—strengthening recently expanded buildings and building facilities.

Fast Tax Writeoffs

For the purpose, two 100% fast-tax-writeoff applications were approved by ODM:

- $219,600 to reconstruct, modify and strengthen a 240x60 ft security area in the basement of its engineering service annex.
- $334,993 to build a new underground 200x85 ft security area with a tunnel to an open area and connections with all plant buildings. This, the plant's primary security area, will have standby diesel equipment to provide emergency light and filtered ventilation.

MILITARY CLARIFIES ITS ADVANCE PAYMENT RULING

WASHINGTON — The muddle over the military's tightening up on advance payments to defense contractors is now clearing. The order was not designed to cut out advance payments entirely. Nor was it geared to doing away with payments normally made under a contract for work completed or work in place. The order to the three services was calculated to tighten up questionable accounting practices allowed in the past for the sake of expediency.

Law Was Ignored

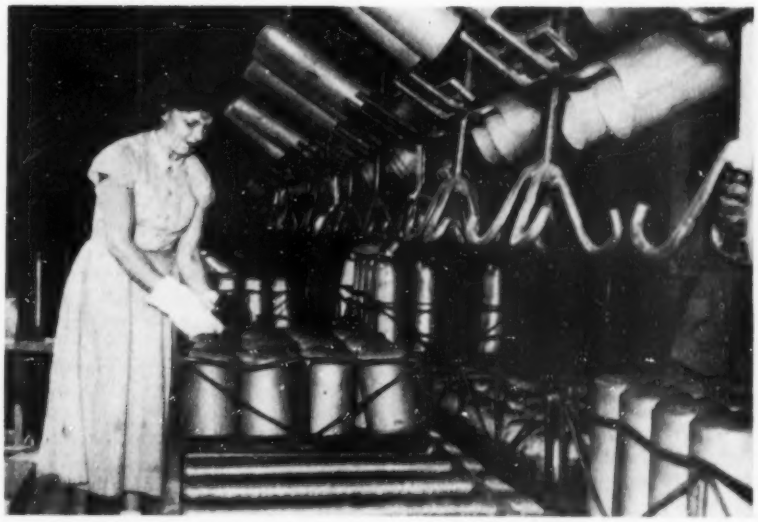
Following Korea's outbreak, procurement officers resorted to letter-of-intent, 90-day contracts in order to help clear Pentagon's enormous backlog of paperwork. So, some manufacturers found themselves setting up production lines and taking supplies from sub-contractors on letters of intent which carry no financing.

As a result, procurement officers advanced contractors funds to accumulate inventories and get suppliers started on sub-assemblies. And in many cases advance payment bore no relation to the manufacturer's capital investment.

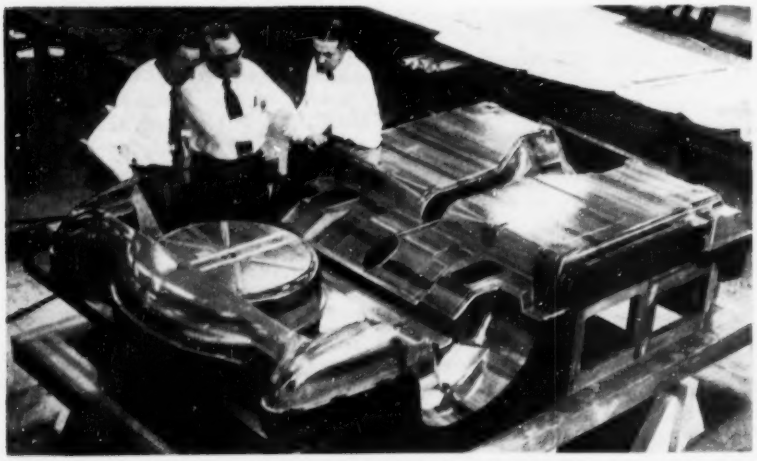
With the defense buildup largely complete, Defense Secretary Wilson sees no reason to continue these practices and insists procurement men stick to the letter of the law.

Out Millionth 90-MM Shell Casing

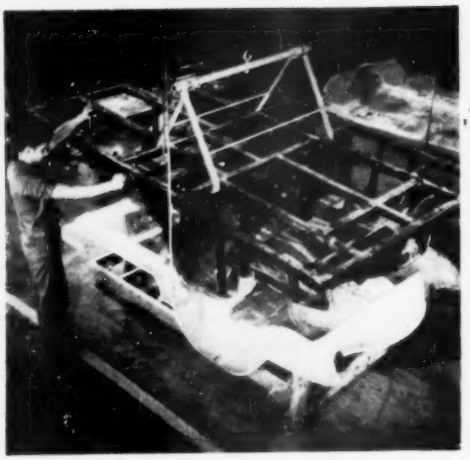
FEEDING STEEL SHELL CASES from an endless conveyor into a press



AUTOMATICALLY CONTROLLED CONVEYOR SYSTEM transports steel shell cases from operation to operation at Ekco's Massillon plant



FIRST STEP IN CHEVROLET CORVETTE PRODUCTION is construction of die models for plastic body section molds. Here is mahogany die model for the underbody, basic element in Corvette body assembly



LOWERING DRILL JIG over underbody to provide guide for hole locations required in riveting body to frame

Chevrolet Irons Out Corvette Production Wrinkles: Sets 1000-a-Month Goal by January

DETROIT—Where are the much-heralded plastic-bodied cars? Only Chevrolet seems to have the answer—its $3490 Corvette, introduced as an experimental model at 1953 motor shows. That was last January. What has happened since? In March, Chief Engineer Edward N Cole was told to set up Corvette production facilities. Reason: GM couldn't ignore Corvette fanciers, who lined up, checkbooks in hand.

250 This Year

In June, Cole and his assistants watched the first Corvette come off a temporary production line at Flint. By this year's end, 250 Corvettes will have been built—equal only to 30 minutes of standard Chevrolet car and truck production. But by January Chevrolet's St Louis assembly plant will be turning out 1000 a month.

This is as far ahead as Chevrolet people talk about, and with good reason. Corvette demand has snowballed past the hottest hopes of Chevrolet's sales department. At least 25,000 people have already expressed a desire to buy a Corvette.

Relative production costs are still not entirely clear. But there's no reason to believe that plastic cannot some day compete with steel.

Initial outlays certainly favor plastic. Corvette tooling cost less than $500,000, whereas as tooling for an equivalent steel-bodied car would cost around $4.5 million, would take months longer.

The point of cost disadvantage—where continued use of plastic would outrun steel costs—is reckoned at 15,000 units annually. Steel body tooling, labor, space and other items beyond that point would amount to less than for plastic.

Reinforced laminated plastic for the Corvette costs upward of 80 cents per lb, about 30 cents more than for steel. But the plastic body weighs only 411 lb, 200 lb less than a similar steel body.

Plastic Production Processes

Body parts are produced by the bag method. Initially, interior surfaces of the required 61 molds are sprayed with a parting agent, then resinous Gelcoat is applied to produce a smooth exterior. Then three layers of glass plastic are laid up in the mold and a backup mold is placed over them.

Pressure is applied by clamping a sheet of polyvinyl plastic over the mold and removing the air between backup mold and sheet. Heat hastens the curing process.

When cured, a part is removed from the mold, trimmed and ground for size. A band saw removes flash at the edges and a sanding wheel trims surfaces to finish dimensions. As they become available, matched metal dies are being put to use. Within three or four months they will probably be used exclusively.

At present, production processes are on the crude side. The chassis line at the Flint plant will accommodate only six cars at a time, and a considerable amount of hand operation is needed.

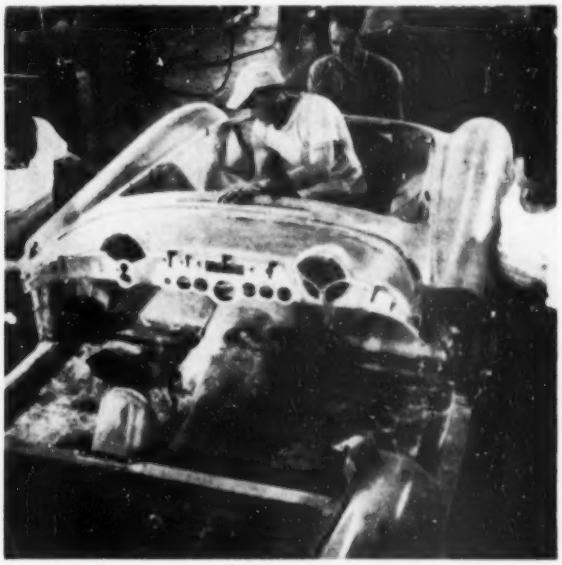
But Chevrolet, patently surprised at the progress it has made thus far in fabricating plastic bodies, thinks manufacturing eventually can be fitted to the customary station system to achieve production speed and efficiency.

Although nobody at Chevrolet feels qualified to estimate the eventual market for plastic cars, the mere fact that officials anticipate use of mass production techniques indicates that the Corvette and its future counterparts are out of the fad stage.

Significantly, one highly placed Chevrolet executive thinks that if production reaches a point where the public can have its choice of a plastic or steel body, "a good many" plastic-bodied cars will be sold.

This same executive, who shudders at mere mention of current steel prices, happily contemplates the tremendous competitive pressure such a development would put on steel producers.

BONDING AND RIVETING MAJOR BODY SEAMS. Here spring-loaded clamps are placed along flange and rivet holes are drilled. Contact flanges have previously been bonded



JOINING FRONT TOP SECTION TO UNDERBODY, which has been fitted with instrument panel and lower portion of seat back. Underbody is mounted on a dolly

EXPLODING A FEW OF THE PLASTIC BODY MYTHS: Chevrolet's production experience with the Corvette has given the lie to several rumors current in auto circles: (1) plastic body stresses do not cause paint to chip off when a Corvette travels over rough roads—and the paint is applied in exactly the same manner as it is to steel bodies—not impregnated into the resin; (2) excessive moisture doesn't weaken those areas where steel comes into contact with plastic (door handles, body bolts). Excessive moisture, say Corvette engineers, causes only a negligible millionth-of-an-inch rise in the plastic surface of the Corvette

MINIATURE CORVETTE ASSEMBLY LINE AT FLINT. Cars start with frame on a six-chassis. Axles, springs and wheels are added before the body drop. After body is attached to chassis and wiring hookups are made, form-fitting bucket seats are installed. Corvette has 150 hp at 4200 rpm, 2850-lb curb weight

MAJOR COMPONENTS of Corvette are, clockwise from lower left, instrument panel, bulkhead and seat back, fender panel, underbody and front end

LOUIS ALLIS UNVEILS NEW ELECTRIC MOTORS

MILWAUKEE—A line of completely redesigned and restyled electric motors for industrial use was announced here on October 15 by the Louis Allis Co.

Design changes make possible "the same horsepower in smaller packages," according to company officials who described the new motors at a press meeting held at the company's plant.

In some cases, they said, horsepower output actually will be doubled for the same frame size.

The redesigned motors, scheduled for marketing about the first of next year, are in the one to 40 hp range and represent an investment of $2.5 million, mostly for retooling.

The motors to be ready in January, according to C G Skidmore, vice president in charge of sales, will be the 1½ and 2 hp sizes. These motors will be shown to the public on November 15. Redesigned motors of larger sizes up to 40 hp will be introduced at later dates.

The smaller sizes, being produced first because they are in greatest demand, conform to NEMA standards established in 1952 to become effective in January 1954.

Company officials estimate Louis Allis has about 14% of the total business in these horsepower ranges. Since 1951, the company has achieved gross sales of almost $30 million annually.

Metalworking Abroad

(McGraw-Hill World News)

AUSTRIA — Ball and roller bearing production increased from 3.4 million to 3.7 million bearings in the first half of the year. But at the same time, exports declined from 836 tons to 595 tons.

NETHERLANDS — Nederlandsche Kaiser-Frazer Fabrieken, N V, of Rotterdam will assemble the entire line of Willys passenger and commercial vehicles for distribution in Europe and Africa.

ITALY—First half production of ball bearings was 16.6 million against 14.7 million bearings for the same period in 1952. Also registering production gains over 1952 are: sewing machines, typewriters, calculating machines. Italy's capital goods index (1938 = 100) rose from 139 in 1952 to 156 in first half 1953.

ODM Bans Leasing of Idle US Tools To Non-Defense Industries

WASHINGTON — Proposed ban on leasing idle government production equipment for non-defense purposes is now official. A firm policy is set forth in Defense Mobilization Order VII-4 ("ODM Policy Guidance on Government-Owned Production Equipment"), issued this month. Rare exceptions will be made in "extraordinary cases."

The new order sets up uniform policy for both the "Production Equipment Redistribution Inventory," owned and managed by the Defense Dept, and the "Defense Mobilization Production Equipment Inventory," managed by the Commerce Dept's Business and Defense Services Administration.

ODM's order provides that PERI tools "for which there exists a known or anticipated mobilization need" be kept in packages at or near the plants that would operate them in an emergency. When adequate storage is not available, this and DMPEI equipment will be stored in government warehouses.

To lease tools in either of the two inventories, a military contractor must apply to the Production Equipment Redistribution Group.

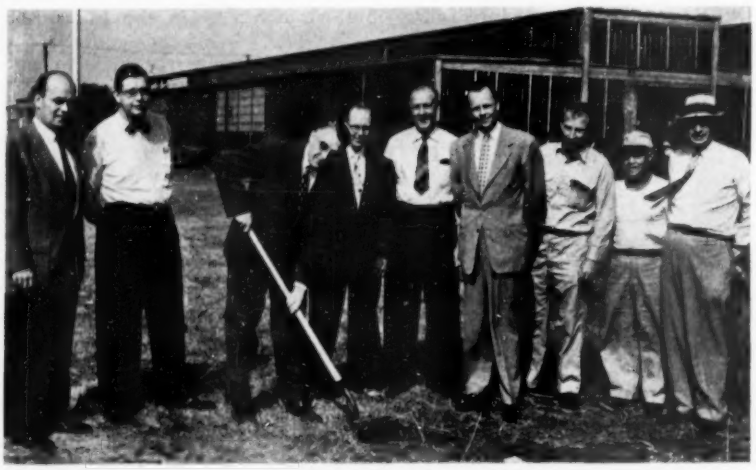
Manufacturers in "defense-supporting" production apply either to the Pentagon or BDSA to lease tools. They must demonstrate that proposed use of idle government equipment will clearly serve public interest or national defense.

Manufacturers must also certify that the equipment cannot be purchased or leased from a commercial source within the time required. And they must prove that a purchase order has already been placed.

The new policy should relieve the machine tool industry's fears that idle government equipment would be leased for non-defense purposes.

They call Army Ordnance's recent decision to allow Studebaker use of $200,000 worth of tools for production of civilian trucks "off base." The tools are part of $1.3 million worth of Ordnance tools stored at Studebaker's South Bend, Ind, plant, formerly used to produce military trucks.

Officials say the Studebaker action was taken before the new overall leasing policy was clarified. A similar case, they say, would now have to be okayed by ODM—and it's certain ODM would turn thumbs down.



BREAKING GROUND AT ROCKFORD MACHINE TOOL CO for an assembly and shipping bay addition to the company's Rockford, Ill., plant. Main building will be 175 x 60 x 49 ft high, will be served by a 35-ton crane. Lower area will house a carpenters' shop, lumber storage, electrical assembly. This, plus a boiler room addition and an enclosed court, will add 18,500 sq ft to present plant. Left to right: K M Allen, executive VP; L Monson, Supt machining; H B Newton, president; Charles M Bradley, architect; L Olson, Supt assembly; R Christenson, controller; E Lagerman, Supt maintenance; E Ostrom, Supt, and G H Anderson, president, Security Building Co, plant contractors

Electrification Holds Spotlight at AIEE's Sixth Annual Conference on Machine Tools

CLEVELAND—Electrification of machine tools for greater productivity and safety was the theme of the three-day Sixth Annual Conference on Machine Tools, sponsored here by the American Institute of Electrical Engineers Oct 14-16.

Presentation of 11 technical papers, a panel discussion on rerating electric motors, and plant tours to Ford Motor Co, Warner & Swasey, Reliance Electric & Engineering Co, and Chevrolet's Transmission plant made up the bulk of the program.

Blackall Sets Keynote

Highlight of the three-day meeting was a banquet address by Frederick S Blackall, Jr, president and treasurer of Taft-Peirce Mfg Co, Woonsocket, R I, president, American Society of Mechanical Engineers and past president, National Machine Tool Builders' Association.

Speaking on "The Engineer's Obligation to a Free World," Mr Blackall urged unity within the engineering professions through inter-society cooperation rather than through an omnibus organization.

US engineers can meet increasing foreign competition, Mr Blackall said, by (1) working together toward more effective standardization, and (2) by simplifying general purpose machine tools.

Influence of the automotive industry on standardization, Mr Blackall stated, has been "great and constructive, but in catering to this important customer, many machine tool builders have gone off the deep end in emphasizing massiveness, multiplicity of controls, and a degree of automaticity practicable only in the mass-production industries . . . The error has been in the assumption that what is necessary to automotive production will probably be suitable for everyone else . . . I believe a tremendous field is open to the machine tool builder and to the electrical supplier in simplification of design of general purpose tools."

"There is, of course, a place for the machine tool which is the ultimate in ruggedness, high speed, variety of special features and automatic controls," Mr Blackall said. "But there is also a place for the general purpose machine tool designed for average conditions. It may be heresy for me to say so, but I believe in many cases we have gone too far in the direction of weight, heft, automaticity, pushbutton controls and other costly features."

Electronic Drives

Speaker at the Wednesday morning session was F E McLane, Westinghouse Electric Corp, who discussed "Specific Applications of Electronic Drives to Machine Tools," particularly with relation to lathes, grinders, planer-millers, bar machines and boring mills. Mr McLane told of such recent electronic drive improvements as packaged systems, the Mot-O-Trol and drives equipped with electronic exciters.

Automatic Controls

Speaking on "Automatic Machine Control," Perry L Nies of Ultrasonic Corp said two problems face the machine tool builder: (1) developing understanding of control possibilities related to production needs, and (2) design, manufacture and sale of computer-controlled machines.

Immediate use of such equipment is somewhat confined to the military, but now that it is being applied to civilian production these problems arise: (1) military-type equipment is overdesigned for industrial use, and (2) electronic maintenance is complex. But, Mr Nies said, machine tool builders are attacking these problems because computer and servo mechanisms can be invaluable in governing change of feeds, motions, sequence of cuts, etc.

Norman F Diedrich, Clark Controller Co, interpreted the controversial National Electric Code in relationship to machine tools in his talk on "Some Bases and Interpretations of the National Electric Code as Applied to the Electrification of Machinery," and explained the Code's engineering background.

Electrical Codes

E J Loeffler of Warner & Swasey Co, speaking on "Today's Machine Tools Need Modern Electrical Codes," said those codes most in need of modification are: (1) conductor capacity and conduit fill, (2) branch-circuit overcurrent protection, and (3) enclosure venting. To remedy the first, Mr Loeffler said, Tables 1, 2, 4, 9 and 11 must be revised. For the second, make the circuit protection section of Article 670 all-inclusive. For the third, eliminate it or revise it drastically.

William L Davis of Douglas Aircraft Co, using the experience of his company as a basis, in his talk on "The Aircraft Industry and Machine Tools" made three requests of machine tool builders: (1) that all machine tool wiring comply with the most rigid state code, (2) that only NEMA equipment be used, and (3) adhere to JIC standards.

W H Compton of Wood-Compton Co told how operators can become more efficient and how firms can save money by paying attention to the "Economics of Location of Control Devices on Machine Tools."

Tracer Controls

George L Rogers and John L Dutcher of General Electric Co stated that top machine tool operation can only be achieved through use of tracer controls, in their talk on "Practical Considerations in the Use of Tracer Controls," and discussed relationship of mechanical and electrical components in tracer-controlled units.

Clutches

A F Gagne, Jr, consulting engineer, talking on "Clutches for Machine Tools," told where and how to use each type of clutch. He traced the origin and development of both positive and friction clutches and showed how a clutch can increase machine tool performance, reduce operating costs, and in some instances cut first costs. Mr Gagne discussed relative advantages and applications of friction, positive, magnetic, rim, axial, and the new Siemens-Shukert magnetic fluid clutches, plus many other varieties.

Samuel Noodleman of Standard Dayton Corp, discussing the "Dynamic Brake Motor," told of its construction and characteristics and applications to jig borers, drill presses, grinders, etc.

Panel Discussion

C O Hedges, Motor and Generator Section, NEMA, led the final technical session, a panel discussion on "Rerating of Electric Motors" and indicated need for improvements in temperature rise, liberality, shaft size, etc.

GIDDINGS & LEWIS HOSTS TO 1500

FOND DU LAC, WIS—Full inspection of latest models of the company's line of machine tools, attachments and cutting tools in operation was afforded the approximately 1500 guests attending a four-day open house held by Giddings & Lewis Machine Tool Co here October 15-19.

Metalworking executives, financiers, customers, dealers and educators were registered from almost every state in the Union, Canada, England and Germany.

Attracting most attention were machines currently being produced for the aircraft industry, as well as tracer-controlled units so sensitive that a visitor could operate the machine to write his name on a sheet of paper.

Informal tours permitted inspection of all machines and of special cutting tools at G & L's Davis Boring Tools Division. On display were horizontal boring, drilling and milling machines.

PRESSED METAL INSTITUTE SEES HYDROFORM DEMONSTRATION at the Roland Teiner Co, Everett, Mass. More than 60 members attending the Institute's fall meeting watched Cincinnati Milling Machine Co representatives demonstrate how the Hydroform performs a single draw operation, presses blanks, and witnessed changes in tooling from one part to another. Left to right: Arthur Woodbury, Roland Teiner Co; John E King, chairman, N E District, PMI; Roland Teiner, president, Roland Teiner Co; Carl Nordberg of T J Rafferty Co, secretary-treasurer of PMI; Everett Talbot of A J Knott Tool & Mfg Co, program chairman, PMI; and George Beatty, Cincinnati Milling Machine Co

GE Carboloy's New Edmore, Mich, Plant Can Produce 2200 Varieties of Permanent Magnets

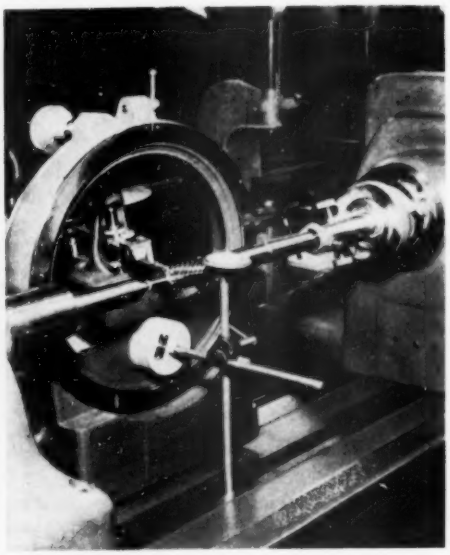
EDMORE, MICH — This tiny town (Pop. 801) is making its bid to become the new "magnetic pole" for US industry with dedication of General Electric Carboloy Dept's ultramodern permanent magnet plant October 15.

Capable of turning out more than 2200 different sizes and shapes of Alnico permanent magnets for all types of metalworking (see illustrations), the Edmore plant embodies push-button controls, newest developments in materials handling, new quality control concepts, unusual methods of grinding, sintering, heat treating and metal casting—all combined into a straight-line production setup.

Two Manufacturing Methods

Magnet manufacture at Edmore is by two methods: (1) casting, for volume magnet production, using conventional foundry techniques, and (2) sintering, for production of small magnets and others requiring close dimensions and unusually high physical properties.

PERMANENT MAGNET, produced at GE Carboloy's Edmore plant, separates steel sheets for easy transfer to stamping operations, eliminates double stamping



ANOTHER APPLICATION for GE Carboloy permanent magnets — delicate measuring gage for checking gear teeth is held firmly in place by magnet

Seventh *American Machinist* Inventory Near Completion; Will Show Effect of Rearmament on Metalworking

NEW YORK—Nearly a year of work to produce the Seventh *American Machinist* Inventory of Metalworking Production Equipment is drawing to a close. The results will show clearly, for the first time, the effect that the Korean War and the defense program have had on the metalworking industries.

From the time of the First *American Machinist* Inventory in 1925, and continuing at periodic intervals through the Mid-Century Inventory in 1949, this study has been the only source of detailed information on the distribution and age of metalworking equipment in the United States. The forthcoming Inventory will be more detailed, and will be derived from a larger volume of individual plant returns than any previous study.

Additional Types Inventoried

Detailed reports on the distribution and age of 165 types of metalworking equipment will be included in the new Inventory. Among several changes in the types of equipment are the division of automatic bar machines into single- and multiple-spindle and of honing machines into internal and other types. Additions to the list of equipment include forging presses, extrusion presses, nibbling machines, chip crushers, and multi-machine coolant systems.

Industry data will be presented in 16 groups, the only change being the division of the aircraft industry into airframes in one industry and aircraft engines, propellers, and parts in another.

Improved Area Boundaries

In response to widespread requests, fairly extensive changes have been made in the geographic data. The United States has been divided into 24 areas, each representing logical manufacturing and marketing divisions.

The Seventh Inventory will report the total number of units of each type of equipment in each industry and each area. Old equipment will be reported in two age groups: machines 10 to 20 years old, and machines more than 20 years old — the same breakdown used in 1949.

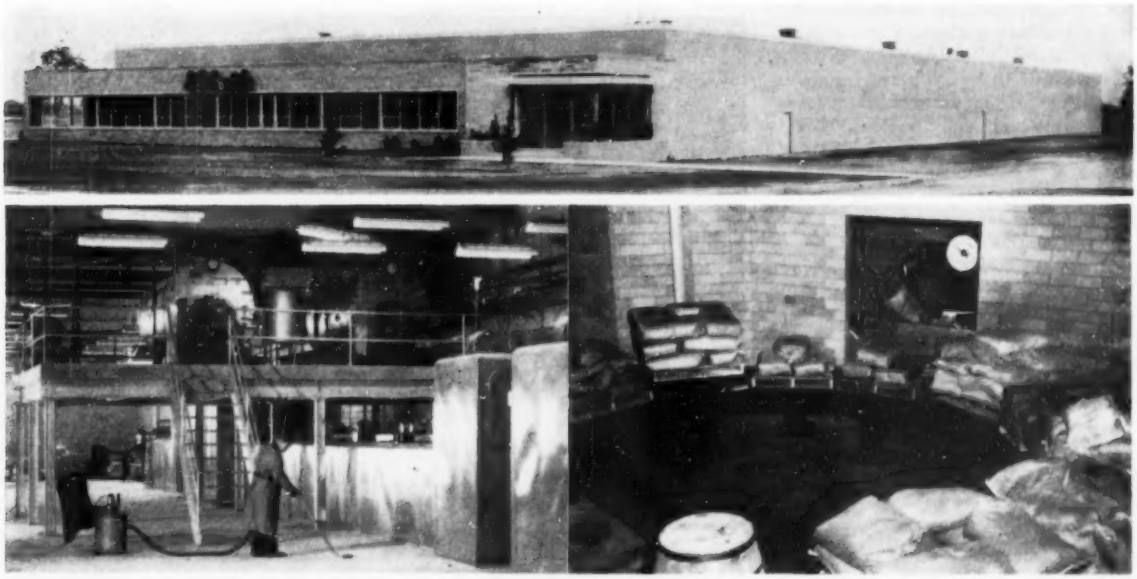
Special studies of metalworking equipment for maintenance and for training are included again, as in 1949, to round out the picture of America's metalworking resources.

2½ Million Workers

Collecting data for the Seventh Inventory has involved sending detailed report forms to more than 20,000 metalworking plants. The metalworking industries have been more cooperative than for any previous Inventory and reports have been received covering more than two and a half million workers.

A staff of statisticians has worked since July to summarize the thousands of plant reports and to expand the samples thus obtained. The expansion formula is again based on shop employment, as in every previous Inventory. The results add up to more than 60,0000 individual figures contained in 160 tables. These tables are presented to make it as easy as possible to locate the desired information on any type of equipment, any industry, or any area.

Preparation of the Seventh Inventory is under the direction of Anderson Ashburn, associate editor of *American Machinist*, who produced the Mid-Century Inventory in 1949.



A O SMITH'S NEW WELDING ELECTRODE PLANT (top) at Lancaster, Pa., will supply eastern and southeastern markets. Built at an initial cost of $1 million, the 41,000 sq ft plant is designed to overcome dust and dirt conditions that plague manufacturers of welding electrodes. Left: entire plant is vacuumed at least once every 24 hrs. Tile wall surfaces minimize dirt, fixtures arranged as to permit unimpeded scrubbing-down. Right: novel "lazy susan" turntable expedites materials handling. Outside operator loads raw materials on table, mixer picks off what he needs

Willard F Rockwell

George J Schad

A H Tinnerman

Max B Mentley

Names in the News

Col Willard F Rockwell, who has resigned as assistant to Secretary of Defense Charles E Wilson, has returned to his post as chairman of the board of Rockwell Mfg Co, Pittsburgh. Col Rockwell joined the Defense Dept last April at the request of President Eisenhower to convert the Army and Navy Munitions Board into the new office of Assistant Secretary for Supply and Logistics.

Clare R Kubik, formerly assistant to the president of Motch & Merryweather, Cleveland, has been named vice president for administration. **W J Chamberlain** moves up from his post as sales manager of the machine tool distributing division to the position of director of company sales. **J F Romans,** formerly plant manager in charge of machine tool building operations has been appointed director of engineering and manufacturing; **E J Kossuth,** sales manager of the used machinery division, has been named its director.

Ernst F Klessig has been appointed director of engineering for Airway Products, Pontiac, Mich. Mr. Klessig joins the company after a seventeen-year association with Vickers.

George J Schad has been named president of Tinnerman Products, Cleveland, succeeding **A H Tinnerman,** made chairman of the board. Mr Schad, associated with the company for the past twenty years, became treasurer and a director in 1946, and vice president in 1952.

Robert E Drury has been appointed to the newly-created post of director of manufacturing of Redmond Co, Owosso, Mich. Mr Drury has been a member of the policy committee and director of industrial relations for the company since February 1952. **Harry E Flint** has joined the firm as general works manager.

Max B Mentley has been appointed vice president, manufacturing, and **Ben F Bregi,** vice president, engineering, of National Broach & Machine Co, Detroit. **George R Smith** has been named treasurer; **D Pierson Smith,** assistant secretary and treasurer, and **Martin Linder,** assistant treasurer.

Harry P Troendly has been elected president of the Spring Div of Borg-Warner Corp. Mr Troendly, who has been vice president and general manager of the division since its founding thirteen years ago, succeeds **David E Gamble,** retired. **M O Gillett,** factory manager, and **Arthur J Welch,** sales manager, have been made vice presidents; **James F Niblick** has been named assistant secretary, treasurer, and controller.

→

Jean Pierre H Wasserman, president of the Societé des Soudures Castolin, Lausanne, Switzerland, celebrates his eightieth birthday during a visit to the US. Mr. Wasserman is one of the oldest living welding research pioneers still actively engaged in industry. His son, **Rene D Wasserman,** president of Eutectic Welding Alloys Corp, New York, presents his father with the first medallions struck to commemorate the event

Ben F Bregi

Roland J Ahern

George L Bachner

W Alexander McCune, Jr

Following the purchase of Peck, Stow & Wilcox Co of Southington, Conn, by the Billings & Spencer Co of Hartford, **Mark J Lacey,** president of Pexto, has been named chairman of the Billings board, and **Roland J Ahern,** president of Billings, will head the Pexto board. The Pexto directors resigned with the exception of Mr Lacey and **Samuel G Wilcox,** executive vice president; in addition to these men, the new directors of Pexto are the present directors of Billings.

W L McCarthy has been appointed works manager of Delco-Remy Div of General Motors, Anderson, Ind; he succeeds **Wilbur J Hulse,** retiring after 40 years with the division. **Robert L Kessler** has been named manufacturing manager in charge of production, and **C A Nichols** director of manufacturing facilities, responsible for activities of the master mechanic and plant engineering staffs. **Clarence Tice,** formerly assistant, succeeds Mr Kessler as divisional master mechanic.

Robert E Sharp and **Alexander S Patten** have been elected vice presidents of the Prestole Corp, Toledo, Ohio. Mr Sharp will continue to serve as general manager, and Mr Patten will be technical director in charge of research.

William C Jordan has been appointed vice president and general manager of Hughes Aircraft Co, succeeding **Gen Harold L George,** who resigned last month. Mr Jordan, who resigned as president of Curtiss-Wright Corp, and Wright Aeronautical Corp in 1949, is a director, and until recently, executive vice president of Hiller Helicopter Co, Palo Alto, is chairman of the board of B M Heede, New York, and president of Seymour Tool & Engineering Co, Seymour, Ind.

George L Bachner has been appointed general manager of the new Powdered Metal Products Div of Yale & Towne Mfg Co. The division unifies under one management the recently acquired Powdered Metal Products Corp of America, Franklin Park, Ill, and the American Sintered Alloys Div, Bethel, Conn, acquired in 1952. Mr Bachner was formerly president of the Franklin Park organization.

C Neil Norgren, assistant general manager of C A Norgren Co, has been elected vice president and secretary of the company. **Aksel Nielsen** has been named vice president and assistant treasurer; **Leigh H Norgren,** plant superintendent, is new treasurer and assistant secretary; and **Floyd R Pool** has been made assistant secretary. All of the men were made members of the board of directors.

George J Bindewald has been promoted to general sales manager of Thomas A Edison's Instrument Div, West Orange, NJ. Mr Bindewald joined the organization in 1946; in 1951 he was made aeronautical sales and service manager. In his new post he will have the added responsibility for selling and servicing all products of the division.

Elbert G Bellows has been named assistant vice president of the W L Maxson Corp, New York. Prior to the appointment, Mr Bellows served as a member of the executive staff of the National Security Industrial Association for the past seven years.

Cecil W Humphreys has been appointed vice president in charge of manufacturing for Shell Chemical Corp. He moves up from his post as general manager and manager of development for the company's manufacturing department.

W Alexander McCune, Jr, has been appointed general sales manager of Norton Co of Canada, Ltd. A former abrasive engineer in the northern New Jersey area, Mr McCune succeeds **C W Fell. Winton A Vagedes** has been appointed an abrasive engineer and will take over Mr McCune's former territory.

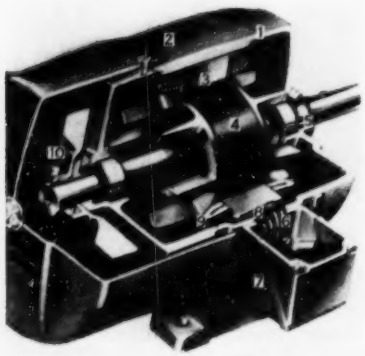
K G Farrar has been promoted from works manager of Douglas Aircraft's Long Beach Div to general manager; he succeeds **James Simpson,** who died early this month. Mr Farrar has served in a number of executive capacities in the company since joining it in 1934. In 1949 he was made superintendent of fabrication and manufacturing control of the division, and works manager in 1951.

OBITUARIES

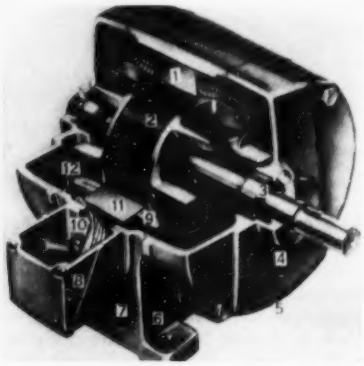
John O Larson, 39, director and executive vice president of Fischer & Porter Co, Hatboro, Pa, died in Hatboro Sept 18. He was also a director of Fischer & Porter (Canada) Ltd, and of Alloy Steel Casting Co. He had previously served as the company's sales manager, and as manager of its sales and engineering office in New York; during the war he was an industrial instrument specialist with the War Production Board.

Thomas J Lopiccolo, president of American Research Corp, Bristol, Conn, died in an airplane crash at Albany, NY, Sept 16. Mr Lopiccolo was vice president and chief engineer for Tenney Engineering, vice president in charge of sales and application engineering at Bowser Technical Refrigeration, and earlier this year founded the company which he headed at the time of his death.

New Shop Equipment



Totally enclosed fan-cooled "55" motor features include: (1) Moisture-proof sealing compound; (2) Complete enclosure by cast iron; (3) Polyester film slot and phase insulation; (4) Solid cast rotor windings; (5) Labyrinth seal; (6) Permanently-numbered leads; (7) Easy access conduit box; (8) Compression-tight seal; (9) Water-shedding stator windings; (10) Split-hub Textolite fan



Drip-proof model features: (1) Polyester film insulation; (2) Solid cast rotor windings; (3) Sealed bearing system; (4) Fully protected end shields; (5) Double-end ventilation; (6) Cast-iron construction (7) Louvered ventilation exhaust; (8) Conduit box; (9) Securely anchored stator windings; (10) Permanently numbered leads; (11) Press-fitted stator punchings; (12) Sonance designed ventilation baffle

GE Line of "55" Motors Offers Decreased Size, Higher Efficiency

The Tri-Clad "55," new line of polyphase ac motors, features a size reduction by volume of 50%, by weight of 22%, per horsepower. Motors incorporate a new insulation system, bearing assembly, and ventilation plan.

Insulation system uses a polyester film reported to be eight times as strong as previously used materials. It is used to insulate the phases and slot tubes in the stator.

New bearing assembly is more tightly sealed and is lubricated by a grease said to last at least five times longer than formerly used lubricants. Double-end ventilation system uniformly cools the motor by drawing in air from beneath both end-shields, through carefully baffled air passages, and out louvers on sides of frame. Larger integrally cast rotor fans increase the cooling airflow through the motor and dissipate rotor heat more effectively.

Major consideration was given to noise level and extensive tests resulted in a motor design reducing overall sound level and altering sound frequency to one more pleasant. Noise level of new 10-hp motor is said to be as low as the former 2-hp model.

The totally enclosed fan-cooled motor has also been redesigned. Electrical parts are completely enclosed by tightly sealed cast-iron frame and end shields, compression-fit lead seal, and rotating labyrinth seal on the shaft.

Although size and weight have been reduced, and new design concepts incorporated, new motor is said to have a higher full-load speed rating and greater efficiency than the former unit.

Improved maintenance features include: permanently-numbered, non-wicking connection leads; larger diagonally-split conduit box; knock-off lugs on the end shields; and location of the combination nameplate and connection diagram directly over the box.

Horizontal drip-proof and totally enclosed fan-cooled models will be available after the first of the year in ratings of 1, 1½, and 2 hp at 1800 rpm.

General Electric Co, Schenectady 5, NY

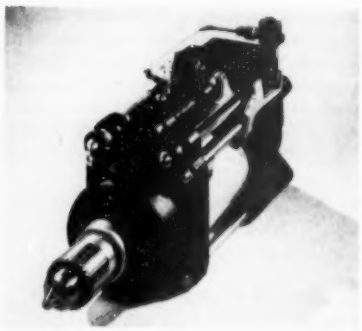
Temperature-Indicating Materials

Tempilstiks, Tempilaq, and Tempil pellets for 413, 425, 438, 463, 475, and 488 F are now available. Range is particularly adaptable in preheating for welding, tempering of tool steels, shell molding.

Addition of these recently-developed items makes company's line of temperature - indicating materials available in 12- or 13-degree steps from 113 to 525 F rating, and in 50-degree steps from 550 to 2000 F. Pellets are designed for temperature range from 2050 to 2500 F inclusive.

Protective coating has been developed for application where Tempilaq is likely to come in contact with water, oil, or grease. Product is applied over Tempilaq layer after it is thoroughly dry. Transparent film developed will function up to 400 F, and will permit melting of Tempilaq to be clearly visible.

Tempil Corp. 11 W 25th St. New York 10, NY



Automatic Air Drill Has 4-in. Stroke

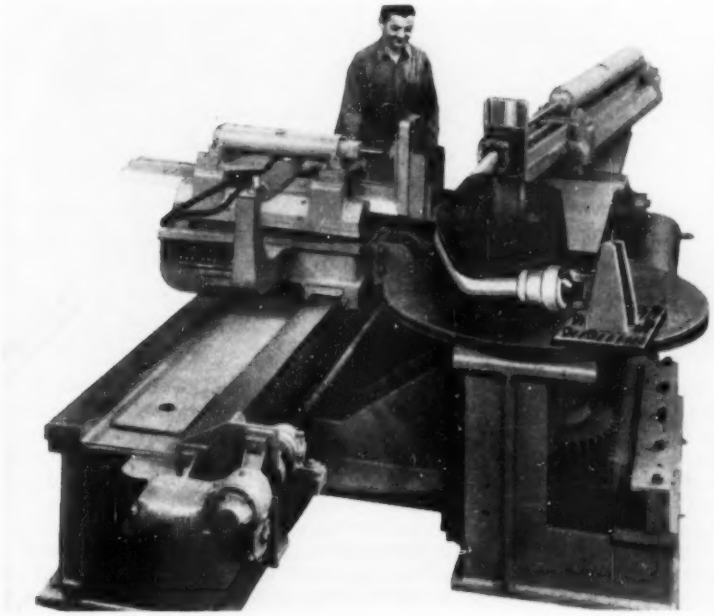
Hause Holomatic drill unit accomplishes single and multiple feed rate operations. Powered by compressed air, it is suitable for automatic or manual cycle control.

Stroke is adjustable to 4 in. with ample thrust for ½-in.-dia drilling in steel. Positive stop has dwell or instantaneous retract operation. Continuous cycling, skip drilling, backfeeding, and manual jogging are reportedly achieved with ease.

Motors are available with capacities to ¾ hp and speeds of 500 to 15,000 rpm.

Hause Engineering, Montpelier, Ohio

Materials and Parts



Right-Angle Traversing Unit Increases Stretch Former's Range and Efficiency

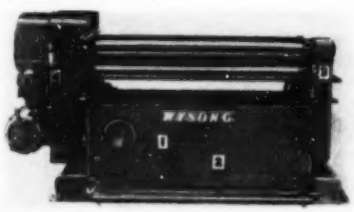
Bath precision stretch former is designed to form a wide variety of contours in extrusions or pre-formed metal sections. Contour and cross-sectional accuracy are maintained by means of a right-angle traversing unit.

Machine consists basically of two related units: the 5-ton stretch former, complete in its own right, and the right-angle traversing unit that wipe forms the stretched metal on the die. The latter is optional equipment, but is said to greatly increase the range and efficiency of the former.

Stretch former itself has ram cylinder rated at 5-ton stretch capacity with a 72-in. stroke and is mounted on a slide guide radially pivotable on the machine bed. The 48-in.-dia turntable is capable of 210° rotation, powered by a hydraulically actuated rack and table spindle gear.

The 2½-ton capacity traversing wipe unit has longitudinal travel of 6 ft, parallel to the bed of the stretch former, and is actuated by gear head motor and screw. In addition to lateral travel, hydraulically operated right angle ram has a 15° swivel each side of center for increased cross sectional control of part being contoured.

Cyril Bath Co. Aurora & Solon Rds, Solon, Ohio



Wysong & Miles Redesign 5-in. All-Steel Rolls

Three new features have been added to the "C" all-steel, 5-in. rolls of Wysong & Miles. These include: fast parallel adjustment of rolls by means of single handwheel with indicator scales visible from the front; safety treadle that extends full length of front of machine; top-roll which rises automatically with lowering of drop-end by single lever. After rising, drop-end automatically locks into position.

Wysong & Miles Co. Greensboro, NC

... INCLUDING

Automatic four-head submerged arc welding machine welds complete trailer body ... page 174

Vertical milling machine for small parts allows milling or drilling at any angle without relocating work page 175

Universal boring and milling machine permits continuous circular milling to be done on work up to 8 ft in diameter page 176

Full forced-convection heating furnace treats 300 lb of metal per hour with use of automatic controls page 180

Precision milling machines, plain, universal, and vertical, feature a sliding column support for front end of knee page 182

Shaper with 10-, 11-, or 13-in. stroke incorporates six ram feeds and six power speeds page 184

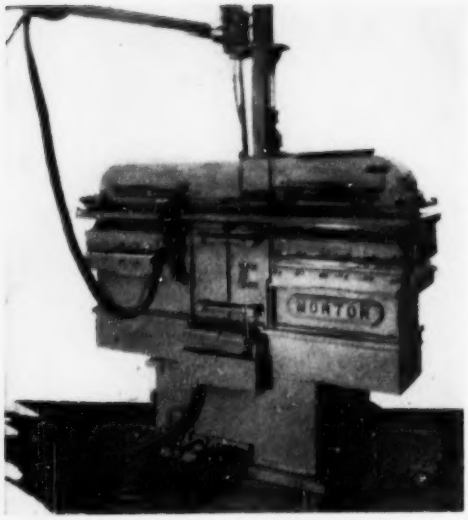
Single-spindle automatic screw machine with ¾-in. capacity has 202 spindle speeds ranging from 63 to 5600 rpm page 186

Split roller bearings can be applied where it is impossible to mount conventional solid ball or roller bearings page 188

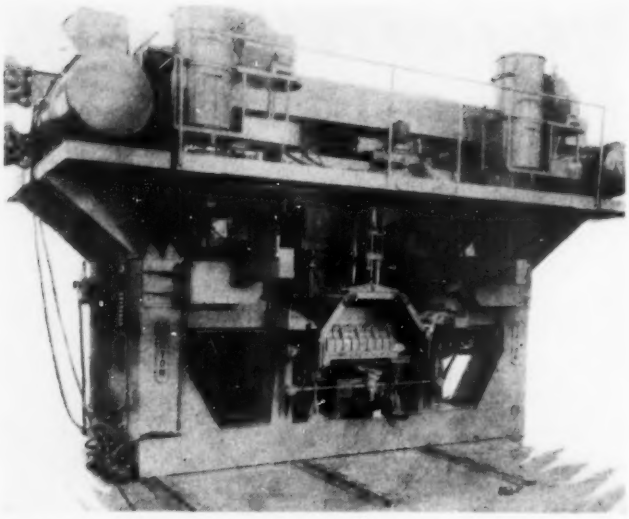
... and in Nov 9

Line of four ram-type milling machines features adjustable cutterhead to permit horizontal, vertical, and angular milling.

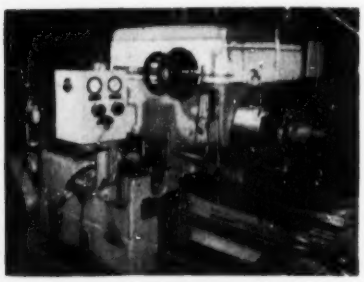
Precision boring and drilling machines feature easily accessible cams and change gears for varying stroke-length or travel rate.



MORTON CAPACITOR CAN WELDING MACHINE uses twin-station setup. Independent speed regulation at corners insures constant velocity welding over entire butt seam of can. Complete automatic control of welding cycle is incorporated and features rapid traverse of welding torch carriage. Other features include use of special fluid and electrical rotary valves to allow continuous rotation of welding torch and power ejection of welded part—*Morton Manufacturing Co, Broadway & Hoyt, Muskegon Heights, Mich*



MORTON AUTOMATIC FOUR-HEAD SUBMERGED ARC WELDING MACHINE welds complete trailer body. A sub-assembled platform consisting of three separate sheet steel parts is power-conveyed to positive stop locations, and fenders are loaded in place. Welding cycle is started after clamping and all four heads make their overlapped welds. Heads are electrically interlocked and synchronized to operate without interference. Flux delivery and recovery is fully automatic. At conclusion of weld cycle, all heads move to clearance stations. Parts are unclamped and welded assembly is power-conveyed out of machine while new parts are inserted—*Morton Manufacturing Co, Broadway & Hoyt, Muskegon Heights, Mich*



Air Chuck Controller Provides Two Pre-Set Pressures

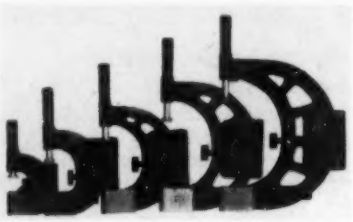
Type 675 air chuck controller was designed to provide two pre-set pressures for pressurizing the air cylinder on lathes provided with air chucks. Dual pressure system is said to be advantageous when castings are being machined and it is necessary for operator to center casting in chuck.

Control valve, two pressure regulators, and gages are mounted in a control box which has three ¼-in. female pipe connections for air supply and control lines to the type 2610 pressure-balanced regulators.

Control panel is provided with a two-position switch marked "External" and "Internal." With switch in internal position, controls are set up for chucking parts from an inside surface.

Control valve has a third position in addition to the usual open and closed. In this position operator may apply enough pressure to the cylinder to hold casting in chuck for centering before full pressure is applied for machining.

Fisher Governor Co, Marshalltown, Iowa



Air Snap Gage Is Direct-Contact Type

Federal air snap gage is designed so work is positioned directly on flat, tungsten carbide, gage anvils and user can feel when work is in gaging head correctly. Air jet does not contact work but, instead, is located in sensitive anvil assembly. Frictionless movement of anvil is read on dial Dimensionair, extra-sensitive instrument giving a direct reading to nearest 0.00005 in.

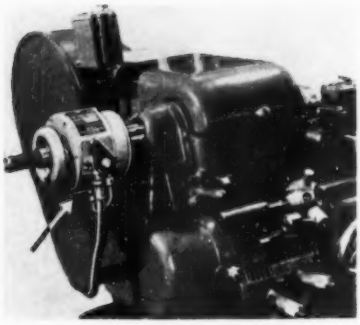
Wide adjustment of gage makes it possible to cover capacity from zero to six inches with five sizes. Large overtravel prevents gage from jamming caused by oversize parts, and insulating handle prevents error through heat transfer from operator's hand.

Federal Products Corp, 1144 Eddy St, Providence 1, RI

Imbedded Bushings

Anchor bushings are available imbedded in laminate plastic drill templets shaped in the same die forms that produced the sheet metal parts to be drilled, assuring perfect match with the contoured parts. Supplied in triangular and rectangular styles; drill sizes from No. 55 (0.052) through F (0.2570), and larger drill sizes on quotation basis.

Hi-Shear Rivet Tool Co, 8924 Bellanca Ave, Los Angeles 45, Calif



Air Collet Closer for Lathes With 1-in. Stock Capacity

Air control for engine and turret lathes of 1-in. bar stock capacity replaces handlevers and handwheels as means of opening and closing collets. A stationary neoprene inner-tube inflates to operate the collet-closing mechanism. All load is carried by two thrust and radial load bearings. Need for rings, piston, and packings is eliminated.

Advantages claimed include: automatic adjustment for variations in stock; consistent accuracy because of controlled pressure on work; use of standard draw-type collet and step chucks; and eliminates jarring of lathe.

Equipment includes adjustable collet-closing mechanism, drawbar, and fingertip valve; extras are air regulator with gage, air hose, and foot control.

Durable Products, 816 W 50th St, Minneapolis, Minn

Vertical Milling Machine Designed for Easy Setup

Vertical milling machine is designed for handling many types of small die work, jig and fixture making, model making, drilling, reaming, and precision boring.

Swiveling spindle head can be set in a vertical plane at any angle, from vertical to horizontal, right or left of zero; spindle can be rotated 360° in a horizontal plane on turret's axis, making it possible to mill surfaces, drill or bore holes, at any angular position without relocating work in holding device.

Unit is available with table up to 6x24 in. with 15-in. longitudinal travel. All twelve models have 5-in. transverse travel, 0 to 12-in. vertical knee feed, 0 to 12 in. between spindle and table, and 2¼ to 8 in. between spindle and column. All models are designed to adapt to specific installation.

Clausing Div, Atlas Press Co, Kalamazoo, Mich

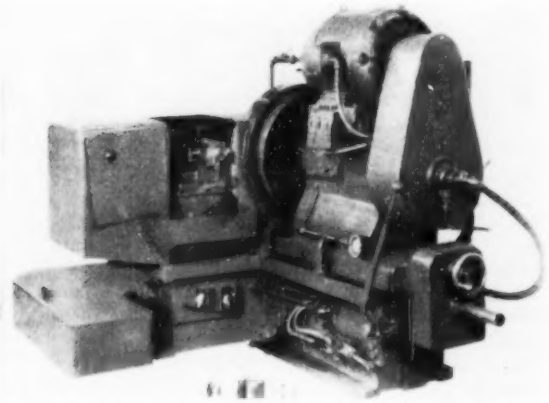
Flexible-Shaft Grinder Gasoline-Engine Powered

Franklin Balmar model DGX-7 gasoline-engine powered flexible-shaft grinder was designed to eliminate need for air compressors and electric power. Unit consists of 5-hp gasoline engine mounted on wheelbarrow-type truck.

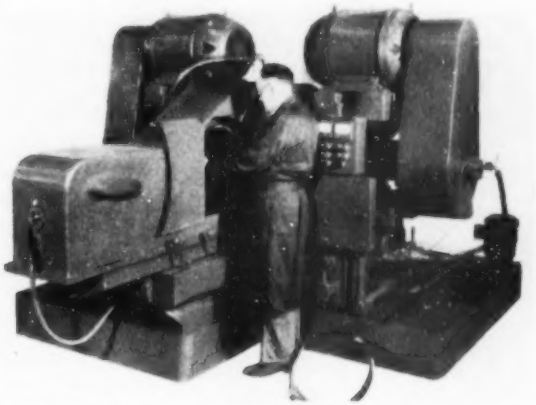
Attached directly to shaft of motor is 7-ft flexbile shaft. At end of shaft is ¾-in. capacity arbor-style hand spindle to take any conventional flexible shaft tool and grinding wheels up to 10x1½ in. Right-angle handpieces are also available.

Engine is mounted on platform by means of swivel base. Base swings through 180° and swivel plate locks in any of five positions.

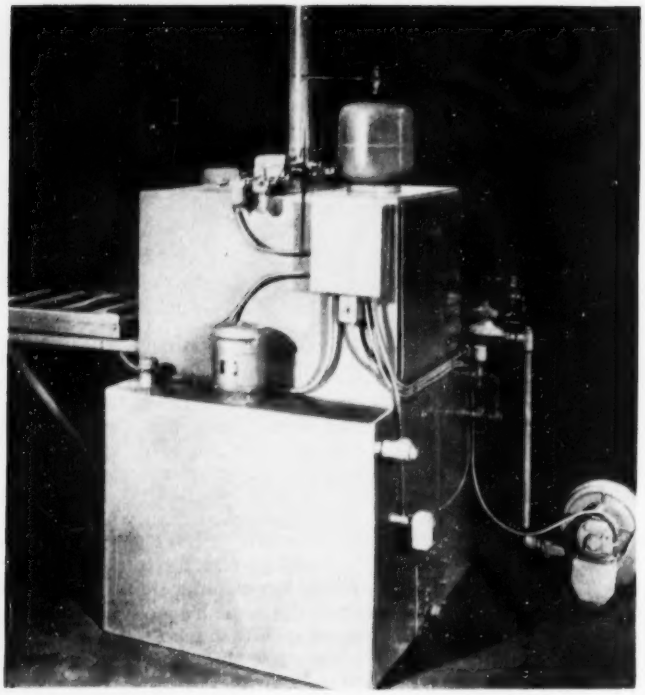
The Franklin Balmar Corp, N A Strand Div, Baltimore, Md



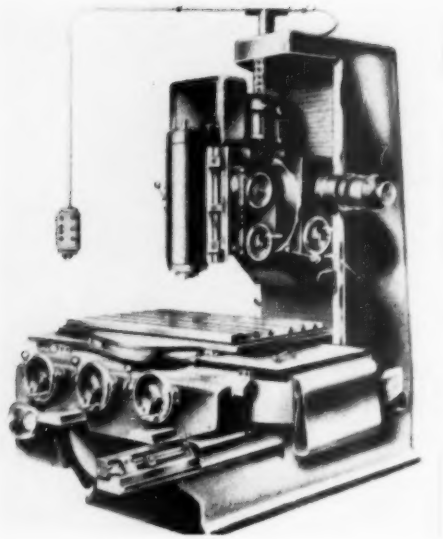
GARDNER 26-IN. HORIZONTAL SPINDLE GRINDER incorporates base of welded steel construction supporting the head slide upon ball bearing ways. Head slide is provided with hydraulic cylinder to hold head against micrometer adjusted stop. Grinding head consists of heavy spindle, 3.937 in. in diameter at wheel collar end, double roller bearing for radial load, and two special thrust ball bearings. Bearings are adjustable. Hydraulically operated worktable travels on dovetailed ways and has 15x18-in. working surface with tee slots for mounting fixtures. 25-hp motor drives grinding head. Production rate for grinding the ends of Alnico magnets is 25 per hr with accuracy for flatness ranging from 0.0003 to 0.001 in.—*Gardner Machine Co, Beloit, Wis*



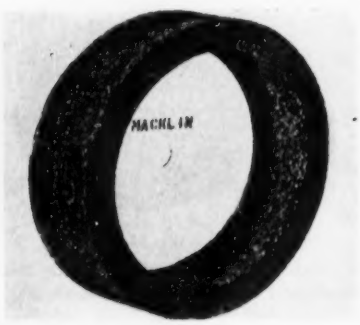
GARDNER 30-in. DOUBLE-SPINDLE GRINDER incorporates hydraulic head-closing attachment, hydraulically operated worktable, wet-grinding system, and rotating fixture to accommodate work (brake bands). Spindle dia is 3.937 in. Anti-friction bearings are used; spindles are driven through V-belts from motors mounted directly above. Circular workholder has gear teeth on OD and is mounted between two sprockets at front and single sprocket at rear. Two 40-hp, 1800-rpm motors power the unit. Two parallel sides of the brake bands are ground simultaneously with production rate of 30 to 40 per hr. Tolerances are from 0.003 to 0.004 in. for parallelism and 0.010 in. for uniformity—*Gardner Machine Co, Beloit, Wis*



LINE OF FORCED CIRCULATION WASHERS features automatic cycling and washing and rinsing in single operation. Single-stage units completely eliminate secondary washing and extra work-handling operations by employing automatic surface spray skim-off. Solution temperatures, work handling, and cycles for solution circulation and skim-off are all controlled automatically by presetting on panel. Solution heating is provided by immersion-type elements. Load rack is held, immersed, and raised automatically by airdraulic cylinder. When preset power-washing cycle ends, surface spray skim-off is started and moves impurities into overflow ledge. Washers are available with load capacities of 300, 400, and 700 lb. Load platforms are swivel-type roller units — *Ipsen Industries, Inc, 715 S Main St, Rockford, Ill*



UNIVERSAL BORING AND MILLING MACHINE, built in West Germany by Bokoe, handles work to 8 ft in diameter. Automatic controls provide for 28-in. traverse and 55-in. longitudinal movement with table feeds infinitely variable from 0.4 to 39 in. Power feed for circular movement, infinitely variable from 0.7 to 70 in., permits continuous circular milling jobs to be done. Milling slide with six mechanical feeds and rapid travel allows drilling and boring operations up to 11⅞ in. Depth of throat is 37.5 in. Infinitely variable spindle speeds range from 36 to 1800 rpm and variable speed changer can be operated without stopping machine. Radial drilling is also possible; by turning swivel column 180°, castings mounted on skids on floor can be drilled. Calibrations are in inches — *Imported by Kurt Orban Co, Inc, 205 E 42nd St, New York 17, NY*



Grinding Wheel For Cemented Carbide Tools

Macklin Co, manufacturers of MM grinding wheels, report that field tests have proved that grinding time can be reduced as much as 50% and wheel life increased as much as 300% by using their product. It is claimed that in the grinding of inserted-carbide single-point tools, MM grinds the shank steel equally as well as the carbide itself.

Construction consists of a fine, loose abrasive embedded in pellet form throughout the wheel. As tool is applied to wheel, a flow of loose abrasive is constantly between metal and wheel. This permits main body of wheel to be harder than is normally used for grinding of carbides.

Macklin Co, Jackson, Mich

Deburring Tool Speeds Sheet Metal Fabrication

Noburmatic tool makes possible the simultaneous deburring and chamfering of both front and back faces of holes in sheet metal, plate, extrusions, castings, and forgings. Device is said to be ideally suited for use in portable drill motors or in stationary machine tools such as drillpresses and turret lathes.

Tool automatically deburs the front face of the metal during entry of tool into hole. Rear side is deburred during withdrawal cycle. Independent controls are provided for setting of working depth or chamfer of both front and rear cutters.

Model GCN is for non-ferrous metals and other relatively soft materials; GCF is for ferrous and tough metals. Standard models are available in individual tool sizes corresponding to drill gages from ⅛ in. to F. Price of standard tools is $24.50 each. Intermediate size tools are also available.

Nobur Manufacturing Co, 717 N Victory Blvd, Burbank, Calif

FYI

FOR YOUR INFORMATION

FREE Catalogs, Booklets, Charts, Calculators

FYI—these initials symbolize information that's important. And there is much of importance in the literature listed here. To get the ones you need, all you do is fill out one coupon for each booklet you wish to order. Indicate in the circle on the coupon the number of one catalog wanted. When you have filled out a card, detach, stamp, and mail. We'll do the rest.

MACHINES AND ATTACHMENTS

1 MILLING MACHINES—*Kearney & Trecker Corp, Milwaukee 14, Wis.* 64-page catalog lists units and accessories, contains data on production machines and rotary head milling method.

2 GRINDERS — *Landis Tool Co, Waynesboro, Pa.* 32-page illustrated booklet provides case studies of solutions of varied problems, operation sketches, and specifications.

3 HONING—*Sunnen Products Co, St Louis 17, Mo.* 20-page booklet X-1 BA-5001 contains typical examples of various applications with production data.

4 TURRET LATHE—*Potter & Johnston Co, Pawtucket, RI.* 4-page illustrated bulletin 150 describes 4-D automatic unit. Dimensions and design features included.

5 HOLE PUNCHING UNITS—*Wales-Strippit Corp, N Tonawanda, NY.* 8-page catalog H illustrates horizontal units for punching holes in curved and straight flanges, rims, angles, and similarly-shaped and formed work. Punches move back and forth horizontally, rather than up and down.

6 THREADING HEADS—*Landis Machine Co, Waynesboro, Pa.* 28-page bulletin F-90-2 contains illustrated information on heat-treated standard and special die heads.

7 MACHINE TOOLS AND THEIR LUBRICATION—*Shell Oil Co, New York 20, NY.* History and development, mechanical aspects, construction, operation, maintenance; functions illustrated, classes described, operating and controlling devices discussed, and application of lubricants.

8 TABLETTING PRESSES — *F J Stokes Machine Co, Philadelphia, Pa.* 21-page revised catalog 801 describes line of single punch and rotary units. Applications illustrated; section included on punches and dies supplied for use with presses.

9 BENCH MILLER—*Rotex Punch Co, San Leandro, Calif.* 4-page circular describes model RM-1 for small production shops. Specifications and attachments listed.

10 METAL COMPACTING PRESS—*Baldwin-Lima-Hamilton Corp, Philadelphia 42, Pa.* 4-page bulletin 3101 illustrates data on Model C 100-ton mechanical unit with hydraulic head for controlling compacting pressures.

TOOLS AND ACCESSORIES

11 Tools — *Chicago-Latrobe, Chicago 10, Ill.* 152-page catalog 51 covers complete line, with indexed, illustrated information. Specifications, recommendations, and maintenance data included.

12 POTENTIOMETER — *Minneapolis-Honeywell Regulator Co, Philadelphia 44, Pa.* 50-page bulletin 1210 covers portable units with direct reading temperature, millivolt, and extended range scales. Includes wiring diagrams, instructions, specifications, and special features.

13 SLIDE CHART—*Vinco, Detroit 27, Mich.* Gives basic tolerances for spline plug and ring gages with PD up to 8 in. Notes on tooth thickness, parallelism, concentricity, and major and minor dia tolerances provided on back.

14 CENTER DISTANCE GAGE—*Sorensen Center-Mikes, Bridgeport 8, Conn.* 4-page bulletin 662 describes tool for providing direct reading within 0.0005 in. of exact dimension between hole centers regardless of hole sizes.

15 CHUCKS—*Horton Chuck Div, E Horton & Son Co, Windsor Locks, Conn.* 40-page catalog E-100 illustrates complete line. Visual reference index and sectionalization of each type with corresponding jaws and parts provided for quick location of related items.

16 HI-SHEAR RIVETS — *Hi-Shear Rivet Tool Co, Los Angeles 45, Calif.* 30-page revised edition of booklet contains illustrated data on applications, gun and squeezer equipment recommendations, hints, methods, and identification.

17 JIG & FIXTURE PARTS—*Standard Parts Co, Bedford, Ohio.* 66-page manual covers 500 tool components and 150 parts drawings which may be used for direct tracing.

Name .....
Title .....
Company .....
Co. Address .....
.....
AMERICAN MACHINIST, New York

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FYI
FOR YOUR INFORMATION

18 THERMOCOUPLES — *Wheelco Instruments Div, Barber-Colman Co, Rockford, Ill.* 42-page catalog and data book TC-10 contains information on complete line of thermocouples, radiation detectors, resistance bulbs, and other accessories for indicating, controlling, and recording instruments.

HEAT-TREATING AND WELDING

19 INDUCTION HEATING EQUIPMENT—*Lepel High Frequency Laboratories, Woodside 77, New York, NY.* 27-page catalog illustrates and describes principles and applications. Data and specifications on tube generators and spark gap converters, work handling equipment, and accessories included.

20 ELECTRIC OVENS—*Blue M Electric Co, Chicago 31, Ill.* 40-page catalog on ovens, furnaces, water baths, humidity cabinet, and incubators for drying, baking, preheating, conditioning, and tempering.

21 PORTABLE MOTOR WELDER — *Generator Sales Co, Chicago 47, Ill.* 4-page bulletin describes unit, with self-contained motor generator, that welds, brazes, grinds, sands, polishes, buffs, brushes, supplies power, and charges batteries. Four models illustrated, with engineering data and prices.

PLANT SERVICE EQUIPMENT

22 LUBRICATOR—*Alemite Div, Stewart-Warner Corp, Chicago 14, Ill.* 6-page folder describes automatic overhead unit for lubricating entire conveyor lines without stopping line.

23 PLANT LAYOUT — *Peerless Photo Products, Shoreham, LI, NY.* 4-page bulletin describes low-cost photocopy system.

24 FLOORING—*The Monroe Co, Cleveland 6, Ohio.* 20-page booklet 168-11 describes resurfacing and repair products, recommends methods and applications.

25 MACHINERY MOUNTING — *Barry Corp, Watertown 72, Mass.* 4-page folder illustrates leveling Barrymounts for keeping machines in place and absorbing floor-borne shock and vibration.

26 DUST COLLECTORS—*Torit Mfg Co, St Paul 2, Minn.* 16-page catalog describes cabinet and cyclone type units, illustrates line of blowers, exhausters, and accessory equipment. Selection data, applications and specifications and charts provided.

27 ELECTRIC HOISTS—*Shepard Niles Crane & Hoist Corp, Montour Falls, NY.* 16-page bulletin 183 contains illustrated information on line of lightweight Lift-about Jr in capacities from 250 to 2000 lb.

28 CLEANING METAL PARTS — *Detrex Corp, Detroit 32, Mich.* 4-page technical folder on Sonicleen process, using ultrasonic energy, describes principle, results, and machines for degreasing all types of metals and molded parts.

29 MICRO-POLISH—*Murray-Way Corp, Birmingham, Mich.* 16-page brochure illustrates and describes units for polishing coils, blanks, and sheets. Engineering specifications and auxiliary equipment provided.

30 TAPER-LOCK SPROCKETS—*Morse Chain Co, Detroit 10, Mich.* 16-page pocket-size catalog B55-53 lists prices and specifications for stock roller chain sprockets. Includes tables, installation and removal procedures, charts, and drive selection procedures.

PARTS AND MATERIALS

31 THREADED FASTENERS—*Triplex Screw Co, Div, Murray Corp of America, Cleveland 5, Ohio.* 80-page indexed catalog 530 contains illustrated information on complete line of nuts, bolts, screws, stems, washers, rivets, and specials. Weights, dimensions and prices listed.

32 MEEHANITE METAL AS GEAR MATERIAL—*Meehanite Metal Corp, New Rochelle, NY.* 36-page bulletin 42 describes and illustrates applications. Contains detailed data on gear casting design and engineering properties of both types of metal used.

33 DIE STOCK MATERIAL — *Hy-dulignum Div, US Bobbin & Shuttle Co, Lawrence, Mass.* 6-page folder describes compressed wood material, 1/6 the weight of steel. Sheet metal production tools illustrated.

34 SPEED REDUCERS—*Westinghouse Electric Corp, Pittsburgh 30, Pa.* 15-page booklet B-5646 covers complete line. Applications given, and standard ratios available for all types; special units discussed.

35 LOCKNUTS—*Security Locknut Corp, Melrose Park, Ill.* 6-page catalog describes and pictures line. Specifications and applications included.

36 GEARS—*Grant Gear Works, Boston 27, Mass.* 176-page catalog describes line of stock gears, speed reducers, sprockets and chains, couplings and special gears. Contains 40 pages of tables and engineering data on power transmission.

37 ROLLED STEEL PRODUCTS — *Bethlehem Pacific Coast Steel Corp, San Francisco, Calif.* 48-page catalog 305-A lists products, including steel sections that can be rolled; gives size, weight per ft, and design properties for all structural and bar size shapes.

38 CONTROL VALVES—*C B Hunt & Son, Salem, Ohio.* 12-page catalog 531 describes Quick-As-Wink line of air and hydraulic units, valve couplings, etc. Includes sectional views, lists sizes, actions, permissable pressure, and temperatures.

39 STEEL TUBING—*Rochester Products, Div, General Motors, Rochester 2, NY.* 12-page brochure covers use, fabrication, physical properties of small-dia tubing. Applications, tables and data, processing and fabricating for various uses included.

40 MOTOR STARTERS—*Allis-Chalmers Mfg Co, Milwaukee, Wis.* 10-page bulletin 14B6410B covers features of Type H starters built to control squirrel-cage, synchronous, wound rotor, and multi-speed motors in ratings from 2200 to 5000 v. Schematic wiring diagrams showing typical methods of control included.

41 TANTUNG — *Vascoloy-Ramet Corp, Waukegan, Ill.* 25-page catalog VR-451 describes Tantung 144, an alloy with greater hardness for use where resistance to abrasion in cutting is important. Machining and mechanical properties outlined, technical data on applications with speed and feed charts included.

42 COMPUTER—*Continental Copper & Steel Industries, New York 17, NY.* Slide-rule calculator provides weights of strips, sheets, bars, and plates of metals and alloys. Factors given, plus condensed version of the ASME code of basic specifications for fabrication of pressure vessels.

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American Machinist
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New York 36, N. Y.

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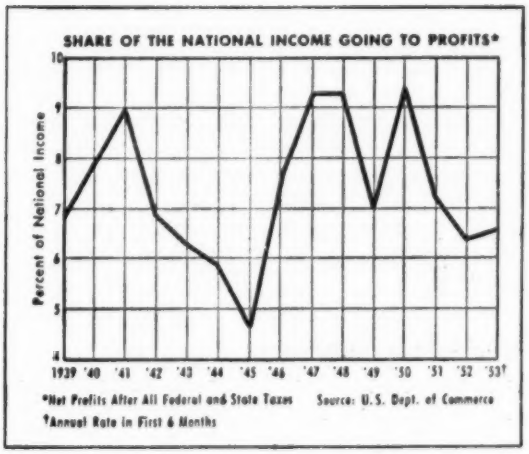
The first of two articles on profits

PROFITS...How High Are They?


SHARE OF THE NATIONAL INCOME GOING TO PROFITS*
Percent of National Income
10
9
8
7
6
5
4
1939 '40 '41 '42 '43 '44 '45 '46 '47 '48 '49 '50 '51 '52 '53†
*Net Profits After All Federal and State Taxes
†Annual Rate in First 6 Months
Source: U.S. Dept. of Commerce

How high are profits? What is being done with them? This is the first of two articles designed solely to throw some factual light on these key economic questions.

One of the important economic developments of 1953 has been a substantial increase in the dollar volume of corporation profits from the level of 1952. But to answer the question "How high are profits?" we must also measure them: 1) by comparison with the record of previous years, and 2) as a share of the total national income. The term "profits," as used here, refers to profits *after taxes*. These are the only profits that can be paid to stockholders or retained for use in the business.

In the first six months of 1953, corporate profits *after taxes* were at an annual rate of $20.4 billion. This was higher than in the first half of 1952, but lower than in the full years 1948 or 1950, or in the first half of 1951. If allowance is made for the declining value of the dollar, this year's net profits for all corporations represent less purchasing power than those made five or six years ago.

Here is the record of profits over the years:

	Net Profits After Taxes of All U. S. Corporations	
	Billions of Dollars	
	Actual	In 1953 Prices
1929	8.4	14.6
1939	5.0	9.8
1947	18.5	22.1
1948	20.7	22.7
1949	16.3	18.3
1950	22.7	24.6
1951	20.1	19.7
1952	18.6	18.7
1953*	20.4	20.4

*Annual rate, first six months

The record shows that real profits have a little more than doubled since 1939. This increase, however, does not mean that corporations are doing exceptionally well. The entire national income has doubled since 1939. And our industrial plant is more than twice as large as it was in 1939. Therefore, profits have just about kept pace with industrial growth.

Return on Investment

How high are profits compared with sales, or compared with the stockholders' investment?

What is the rate of return to the people who have invested their savings in corporate business?

The table below shows that for the past three years the rate of return on both sales and investment has been substantially below the return achieved in earlier postwar years. The rate of return on stockholders' investment is higher now than it was in 1939. But this is primarily because today's profits are reported in terms of today's prices, whereas much of the investment in plant facilities is still carried on the books at prewar prices, which are substantially below the cost of replacement. The current rate of return, measured as a percentage of total corporate sales, is below prewar levels.

	Corporate Profits After Taxes	
	Per Cent of Total Sales	Per Cent of Stockholders' Equity *
1929	6.1	NA
1939	4.1	4.0
1947	5.3	
1948	5.3	
1949	4.4	14.8 average
1950	5.3	
1951	4.1	11.8
1952	3.6	10.3
1953#	3.7	10.8

* Manufacturing corporations only
NA Not available
\# Annual rate, first six months

In considering these figures, it should be remembered that they are averages for all corporations. Some companies make more than the average, and many make no profit at all. In every year since 1915 at least 25% of all corporations have operated at a loss. In 1939, 58% of all corporations were losing money. This year the figure will probably be at least 30%. The improvement since 1939 shows a much healthier economy. But it does not indicate that profits are easy to make.

How Big a Share of the Pie?

The most important single fact about profits is that they now represent a *smaller* share of national income than they have in past years of normal prosperity. For the past three years, profits have taken a smaller share of the pie than in 1939, and considerably smaller than in the early postwar years. Here, as the chart at the beginning shows, is the record:

	Corporate Profits After Taxes as a Percentage of National Income
1929	9.6
1939	6.9
1947	9.3
1948	9.3
1949	7.5
1950	9.4
1951	7.2
1952	6.4
1953*	6.6

*Annual rate, first six months

The main reason for the declining corporate share of national income is, of course, the increasing share taken by the federal government in the form of taxes. The wage earners' share is also higher than in 1939. But the really startling increase is in federal taxes. Taxes on profits now equal almost 8% of the national income, compared to only 2% in 1939.

Why This Is Important

It is important that these facts about profits and taxes be widely understood. At its next session, Congress must consider what to do about the emergency taxes on profits enacted after the outbreak of the Korean War. The so-called excess profits tax is scheduled to die on January 1, 1954. In the absence of new legislation, the rate of the corporate income tax will drop from 52% to 47% on April 1. Many factors, including the revenue needs of the government, must enter into the decision whether or not to reduce taxes. But one fact stands out clearly: By comparison either with past years or with the total national income, corporate profits today are relatively low.

• • •

The second article in this series will discuss what corporations do with their profits.

McGraw-Hill Publishing Company, Inc.

Bronze Extrusion makes a stronger sales case for this industrial glass thermometer

The case for this "American" Industrial Glass Thermometer made by Manning, Maxwell & Moore, Incorporated, Stratford, Conn., used to be a steel stamping. Now it's made of ANACONDA Extruded Bronze.

Why the change? Because this extruded bronze shape makes a far stronger and more rigid case; it's easier to produce; it simplifies assembly—and adds additional quality to an already high-quality product. So accurate are these bronze extrusions that neither straightening nor machining is needed for assembly. And assembly time itself is cut.

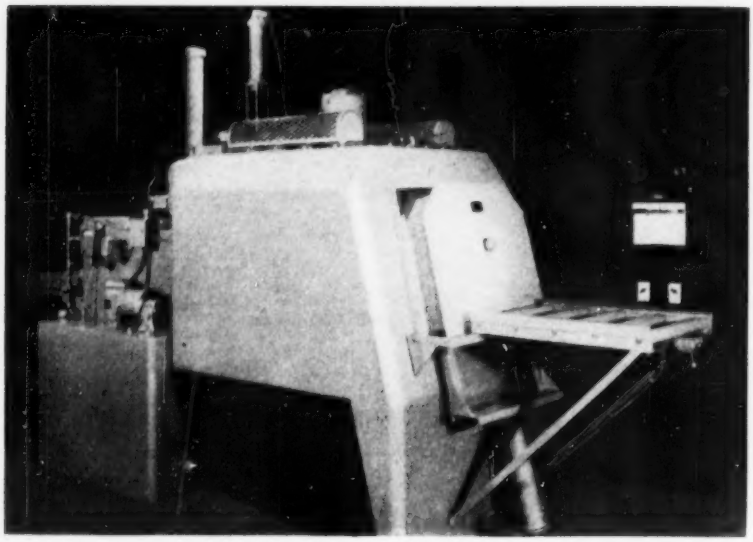
For the base, an ANACONDA Brass Die Pressed Forging is joined to the case by brazing to provide greater joint strength. By machining the appropriate face of a single-style base forging, a stem connection can be provided at any angle.

ANACONDA Brass and Bronze have long been making a stronger "case" for products—by simplifying production; by the higher quality that is always associated with products made of brass or bronze; by increasing sales appeal. We urge you to consider the advantages of these metals for your manufacturing processes and your products. For information, write to The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

Base forging can be machined to provide stem connection at any angle and direction.

Extruded case and forged base for this 9-in. "American" Thermometer are joined in perfect alignment by brazing. No machining or straightening is required.

ANACONDA® —the name to remember in **COPPER—BRASS—BRONZE**



Mall Pneumatic Impact Wrenches

Three new Mall pneumatic impact wrenches offer sizes to meet individual needs. They tighten or remove bolts and nuts, remove broken capscrews and studs, do tapping, reaming, and drive or remove lag screws and screw spikes.

Model 5014S takes $\frac{7}{8}$-in. bolt, spindle has $\frac{3}{4}$-in. square drive, speed is 1600 rpm free at 90 psi. Model 4012P takes $\frac{3}{4}$-in. bolt, spindle has $\frac{3}{4}$-in. square drive, speed is 1300 rpm. Model 308P has capacity of $\frac{1}{2}$-in. bolt, spindle has $\frac{1}{2}$-in. square drive, speed is 1400 rpm.

Mall Tool Co, 7725 S Chicago Ave, Chicago 19, Ill

Forced Convection Heating Furnace Treats 300 lb of Metal per Hour

Ipsen T-3000 automatic heat treating unit features full forced convection heating. Operating at temperatures to 1850 F, unit also features controlled atmosphere and automatic handling.

T-300 is said to answer a variety of metal-treating needs including carburizing, normalizing, stress relieving, and brazing.

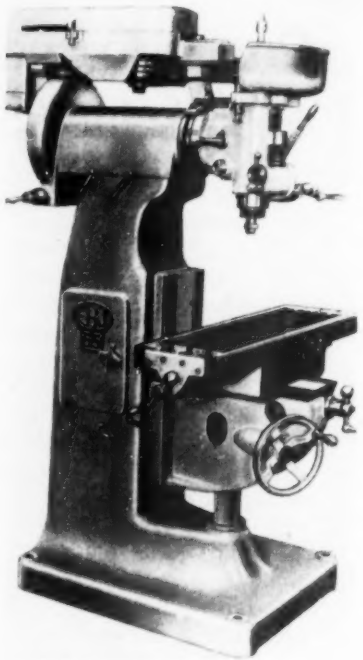
Forced convection heating uses radiant-heating tubes, baffles, and fan mounted in roof of furnace. Tubes are spring loaded and completely sealed by compression bellows.

Cold-chain transfer method automatically moves work tray from heating to quench zone. Work which is to be oil quenched is lowered automatically into circulating oil. Dual propellers located on both sides of tank circulate oil past curving baffle and downward through load for positive quench of all parts.

Work requiring atmosphere cooling is kept on quench-cool rack in raised position above quench tank. Automatic controls maintain proper temperature in water-jacketed cooling chamber.

Cycle control automatically regulates time, temperature, and work movement through heat, quench, or cooling. Hearth dimensions are 24x36x12 in.

Ipsen Industries, Inc, 745 S Main St, Rockford, Ill

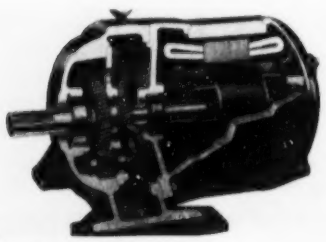


British Vertical Milling Machine

E H Jones vertical milling machine is designed for high speed milling and die sinking. Head can be swiveled 90° in either direction through worm and wormwheel arrangement. This is said to enable head to be set very accurately and swiftly to any angle.

Machine has working surface of 32x11 in. and comes equipped with standard $\frac{3}{4}$-hp motor with 8 speeds from 125 to 2960 rpm. It has $\frac{5}{8}$-in. collet capacity.

Imported by British Industries Corp, International Machinery Div, 16½ Duane St, New York 13, NY



Single, Double, Triple Speed-Reduction Gearmotors

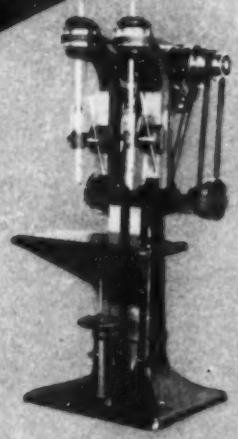
New line of Elliot gearmotors includes integral power units with single-(780 to 280 rpm), double-(230 to 45 rpm), and triple-(37 to 7.5 rpm) speed reduction. Units are available with any Crocker-Wheeler motor. Frame sizes run from 1 to 150 hp. Mountings may be horizontal, ceiling, sidewall, or inclined. Also available is a complete integral power unit with the Crocker-Wheeler disk brake.

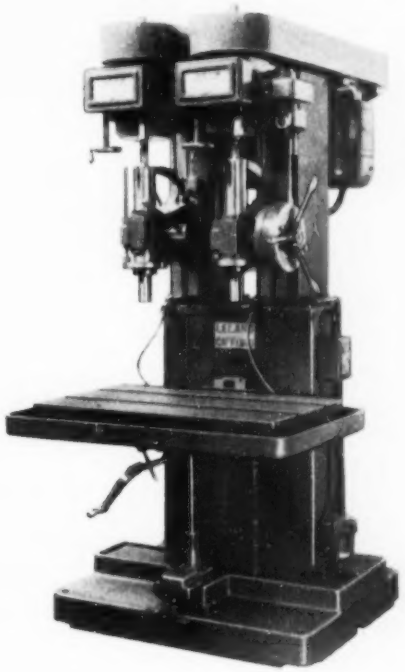
Positive oil seal between gears and high-speed bearing reportedly lengthens bearing life by sealing off abrasive matter. Oil reservoir provides splash lubrication for precision-processed, file-hard gears.

Other features include locked motor-shaft pinion to provide positive contact for minimum vibration on reversing service; cast iron pyramidal base for maximum strength; and extra-capacity anti-friction bearings for severe operating conditions.

Elliot Co, Crocker-Wheeler Div, Ampere, NJ

The Big Difference is in your PROFIT!





You can see at a glance that the new Leland-Gifford Drilling Machine is equipment any shop would be proud of — inspiring operators to do their best and lending a look of modern efficiency to the plant.

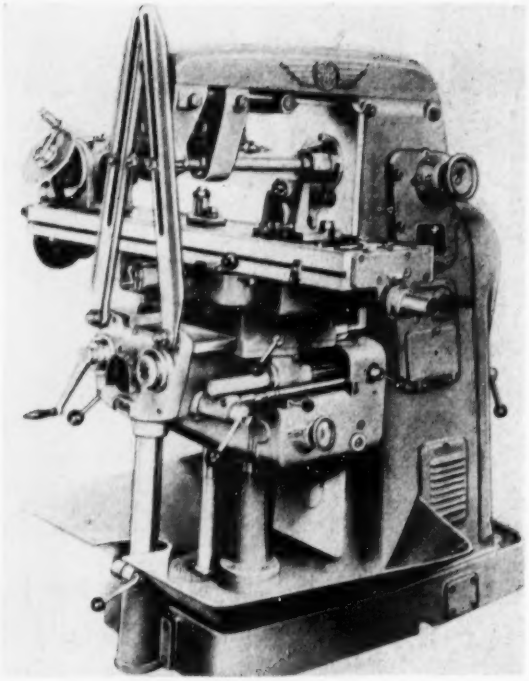
Heavier and more rugged than the old drilling machine; it has individual motor drive in place of the belt drive; radial and annular thrust bearings instead of plain thrust bearings, oil mist lubrication replacing open lubrication and multi-spline spindles where single spline spindles were used.

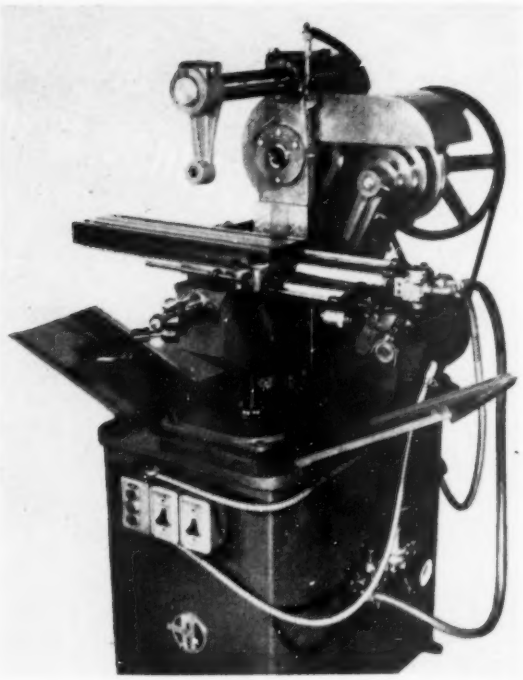
But the big difference is in your profit. Today's pace demands faster production and greater accuracy. Modern Leland-Gifford Drilling Machines have what it takes not only to keep you ahead today, but to enable you to operate at a profit in the face of even higher standards which may be expected tomorrow.

Write For Complete Information

LELAND-GIFFORD
Drilling Machines

WORCESTER 1, MASSACHUSETTS, U.S.A.





Millers Have Sliding Column Support for Knee-Front

Hercules No 2 precision milling machines, plain, universal, and vertical, are built in Denmark to American standards. Millers feature a sliding column support for front end of knee; support can be clamped in any position for increased rigidity. Hardened and ground gears are used and milling spindle runs in adjustable roller bearings. Column and knee ways are also hardened and ground.

Machines are equipped for power rapid traverse in all three directions and the table feed and rapid traverse are all controlled by a single lever. Electro-dynamic braking provides quick stopping action. Weight of table, saddle, and knee is counterbalanced by heavy coil spring inside support column. Automatic lubrication is supplied by built-in oil pumps.

Drive to spiral dividing head permits rotation of dividing head spindle while table is at rest. Spindle nose is standard No. 50 and front bearing is double-row, adjustable-roller type.

Spindle speeds (12) range from 40 to 900 rpm. Longitudinal and cross feeds (12) range from 0.47 to 16.93 ipm; vertical from 0.23 to 8.46 ipm. Power rapid traverse is 31½ ipm, vertical; 63 ipm, cross and longitudinal. Table (51x12 in.) has travel of 32 in. longitudinal, 9 in. cross, and 17 in. vertical.

Special equipment includes vertical milling attachment and rotary tables with or without indexing feature.

Imported by Parker Machine Co, Inc, 158 Pioneer St, Brooklyn 31, NY

Wallace Portable Bender Uses Drillpress ¾-hp Motor

Wallace No. 60 bending machine uses a Skill drillpress ¾-hp motor to actuate the bending by simply pulling trigger switch. Toggle switch above trigger switch controls forward or reverse rotation of the bend.

Device will bend from ½- to 1¼-in. IPS pipe to 180° and averages 60 bends per hour with one man. Limit switches are preset at factory for 0 and 180°.

Wallace Supplies Mfg Co, 1300 Diversey Pkwy, Chicago 14, Ill

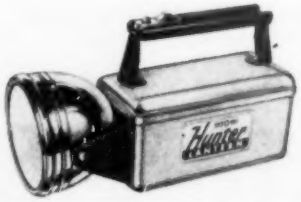
Rotex Punch Co Production Mill

Semi-automatic mill, said to be in the price range of many bench mills, has been introduced by Rotex Punch Co. It is reported that greater production is achieved by principles of rapid approach, infinitely adjustable cutting speeds, and automatic return.

The large-diameter spindle is supplied with choice of three spindle bores: No. 9 B&S, No. 10 B&S, or No. 4 Morse taper. It is equipped with large Timken bearing and has 15 spindle speeds.

There is a choice of 2- or 3-slot tables; T-slots are milled from solid. All models are equipped with Bellows air-feed and hydro-check units.

Rotex Punch Company, Inc, 2350 Alvarado, San Leandro, Calif.



HUNTER LANTERN has switch placed at top of handle. Unit is prefocused and equipped with flasher button; has 3-in. vacuum aluminized reflector — *Ray-O-Vac Co, 212 E Washington Ave, Madison, Wis*

Work heavy, bulky, hard to move?

Bring the tool to the work...

with Black & Decker Sanders and Grinders!

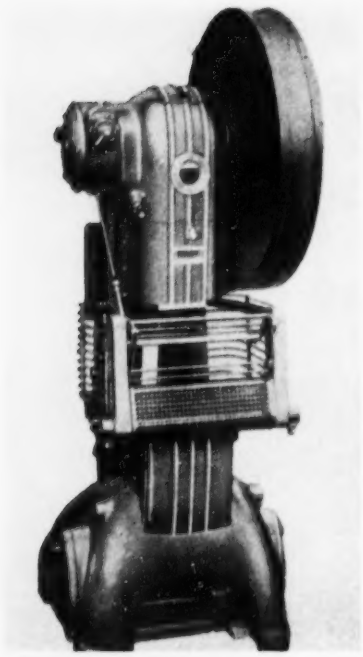
B&D SANDERS
drive attachments for sanding metal and wood; grinding down welds and casting ridges; cleaning castings, structural steel, tanks, boilers, vats, sheet metal and soldered joints. 7" and 9" disc diams.

B&D PORTABLE GRINDERS
prepare surfaces for welding; smooth welds, snag and grind castings; remove rust, scale, old paint; cut off old rivets, studs, bolts, grind, clean and buff frames, cabinets, etc. 5" and 6" wheel diams.

They're powerful and portable!

NO MATTER how big or bulky your abrasive jobs, you'll cut costs and speed up work when you switch from hand methods to Black & Decker power! B&D Sanders drive abrasive discs, saucer grinding wheels, "Whirlwind" wire cup brushes, gouging and planing heads. B&D Portable Grinders drive grinding wheels, "Whirlwind" wire wheel brushes, cotton buffing wheels. And *both* give you: (1) Dependable, full-powered motors tailor-made by Black & Decker for the tools they drive; (2) Perfect balance for easy handling, less operator fatigue; (3) Tough, longer-lasting parts for extra years of service, lower tooling costs!

See your nearby B&D Distributor for demonstrations, expert help on any tooling problem. Write for free catalog of over 100 Electric Tools to: THE BLACK & DECKER MFG. Co., 604 Pennsylvania Ave., Towson 4, Maryland.



15-ton Power Press Has 5¼-in. Throat Depth

British power press features selective fingertip control, clutch interlock, built-in work counter, ball-bearing-mounted flywheel, and oil-immersed multi-jaw chuck. Stroke is optional in ½-in. steps from ½ to 2½ in. Depth of throat is 5¼ in.

Safety guards, removable from die space, are integral part of press control mechanism. They are positively interlocked with clutch extractor mechanism and remain locked in closed position during operating cycle.

Imported by Morey Machinery Co, 410 Broome St, New York 13, NY

Insulating Joints for Electrolytic Tank Piping

Barco joint was developed to provide an insulating barrier in a pipe without interfering with its capacity or efficiency for conveying liquids or gases.

Joint consists of threaded malleable iron ball end-supported between two non-conducting O-type molded gaskets housed in a threaded malleable iron casting. In dry condition these joints have resistance of 10^6 ohms. When used with water, resistance depends on acidity of water.

Joints are available for pipe sizes ranging from ¼ to 6 in., for temperatures to 425 F, and for pressures to 300 psi (steam) or 2000 psi (hydraulic).

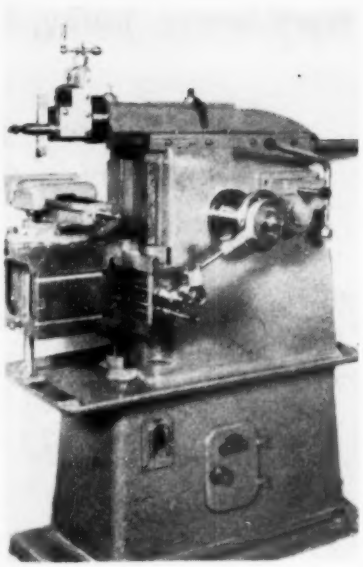
Barco Manufacturing Co, Dept J-1, 500 Hough St, Barrington, Ill

Pangborn Dust Collector Is Self-Cleaning

CH-3 collector uses principle of reverse airflow for continuous cleaning of its cloth filters. Traveling manifold covers three vertical rows of cloth-covered screen frames at one time. Reverse flow of air is blown through center row of screens while normal airflow through other screens is blocked off. Blocking action is accomplished by flexible diaphragm on manifold which is inflated against grid wall under flow of pressure when blower unit is centered on particular row.

Features include: all steel wire mesh frames; screens of convenient size; cloth filter bag of simple design; electrical grounding on screen frames; all moving parts of cleaning mechanism located on clean air side; and accessibility for inspection on both sides.

Pangborn Corp, Hagerstown, Maryland

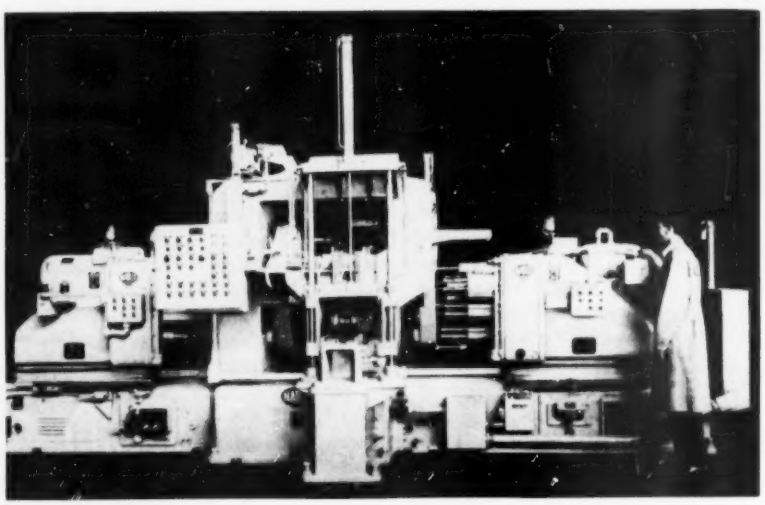


Swedish Shaper In Three Sizes

Prema model 02 shaper is available with 10-, 11-, or 13-in. stroke. Drive is by V-belt from 2-hp motor. Six ram speeds (30 to 150 spm) and six power feeds are provided. Base and column are solid cast iron.

Features include alloy-steel gearing, anti-friction bearings on all shafts, heavy ram slide and cross slide, hand-scraped sliding surfaces, adjustable stroke during operation, and swiveling tool head.

Imported by Austin Industrial Corp, Box 430, White Plains, NY



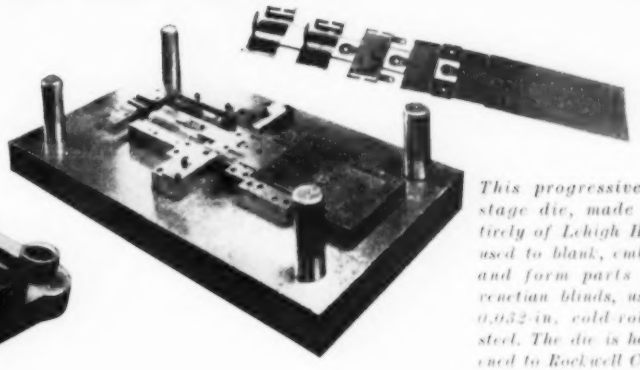
HOLESTEEL MACHINE loads, drills, countersinks, taps, and unloads tractor track rollers. Part is rolled onto track and automatically elevated for rolling into position opposite proper one of three arbors which clamp part into trunnion fixture. Part is carried by automatic indexing into position for drilling and countersinking both ends. Another automatic indexing positions part for tapping. Production is 72 parts per hr — *National Automatic Tool Co, Inc, Richmond, Ind*

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

Door Knobs are blanked and drawn from 0.035-in. steel or brass on this Lehigh H progressive die. Before Lehigh H was used, the die was redressed almost daily. Now, in addition to providing a better surface on the Knobs, the die requires redressing only every sixth week.



This progressive 7-stage die, made entirely of Lehigh H, is used to blank, emboss and form parts for venetian blinds, using 0.032-in. cold rolled steel. The die is hardened to Rockwell C-61.

THREE HIGH-PRODUCTION DIES MADE OF LEHIGH H

Lehigh H is a high-carbon, high-chromium tool steel with characteristics that make it ideal for high-production dies for long-run jobs. Here are the reasons why toolmakers have used it over so many years, with excellent results:

1. Maximum Wear Resistance. Because of its high carbon-chromium content, Lehigh H puts up good resistance to wear. It is the most economical steel for long runs.

2. Close Tolerances. Lehigh H is an air-hardening steel, with only minimum distortion during heat-treatment.

3. Safe Hardening. It is cooled in still air from a hardening temperature of 1850 F, and minimizes the cracking hazards of intricate dies, thin sections, and insufficient radii.

4. Severe Service. Lehigh H is a deep-hardening steel, even in large sections, and has high compressive strength.

When three die rings were needed for high-production blanking of covers for large drums for shipping carbide, the manufacturer specified that each ring be held to close tolerances, and after hardening have a Rockwell-C hardness of 61 to 63. The rings were made from Lehigh H. Each was given a C-scale Rockwell test at four points, with these results: Ring 1: 61, 62, 61, 61; Ring 2: 62, 62, 63, 62; Ring 3: 62, 62, 61, 61.

Peeling Off Ribbons

This chip is curling off the tread of a 33-in. railroad car wheel. The tire-forming tool, nearly hidden at the left, is made of Bethlehem 66 High-Speed Steel, and is used for both roughing and finishing. On untreated wheels these tools average about 45 wheels before regrinding is necessary; on heat-treated wheels, they average 16 per grind.

66HS is ideal for a wide variety of cutting tools. It's our M2 grade, containing 6 pct tungsten, 5 pct molybdenum, 4 pct chromium and 2 pct vanadium.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

Improper Tool Clearance Reduces Tool Life

In operations such as punching and blanking, the service life of the tool is largely dependent upon the tool clearance. For example, many punch-and-die sets are made up with a "standard" clearance. But as the proper clearance for punching soft steel is approximately one-tenth of the stock thickness, it is evident that the "standard" clearances are correct for only one stock thickness.

The ideal tool clearance produces flat, sharp punchings with minimum tool load. Excessive clearance produces deformed and burred punchings, and requires high tool loads which shorten tool life. Though insufficient clearance produces flat, sharp punchings, it also requires excessive tool load, and should therefore be avoided. Besides, it increases the danger of damaging the tools because of misalignment.

Vapor Degreaser Cleans 500 lb of Steel per Hour

Manpro B-121 vapor degreaser reportedly cleans and dries dirty parts in 50 sec. Features claimed are: two vapor-controlling condensers; large work clearance: 31x20x16 in.; divided tank to provide boil pump and spray pump sump; pressure spray; and Manpro Bar-L unit with two safety thermostats.

Normal capacity is 500 lb of steel per hour. Price: $534. Unit requires only 220-v power and can reportedly be installed in 15 min.

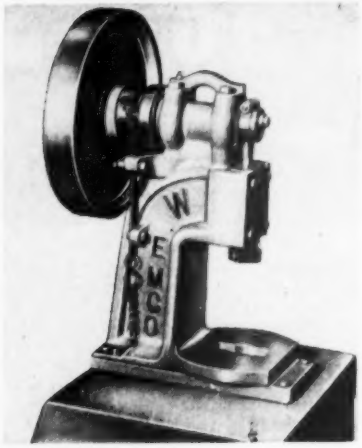
Manufacturers Processing Co, 1360 Hilton Rd, Detroit 20, Mich

Lift Hook Features Locking Safety Gate

Bullard-Burnham safety hook has a gate which locks automatically and will not open unless pin is manually depressed. The gate uses the hook shank as its operating base, yet does not obstruct throat of hook. It swings open horizontally on shank axle.

Safety hooks are drop-forged steel and component parts are cadmium plated. Non-corrosive hooks are brass and are available with or without return spring for automatic closing. Rust-proof lockpins are of Duronze.

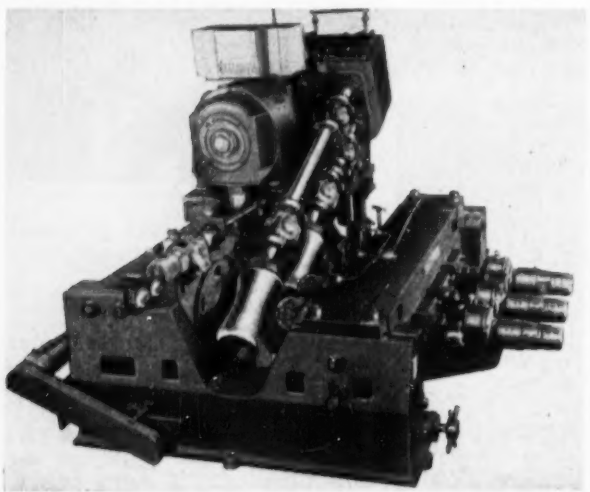
Safety Hook Div, E D Bullard Co, 275 Eighth St, San Francisco 3, Calif



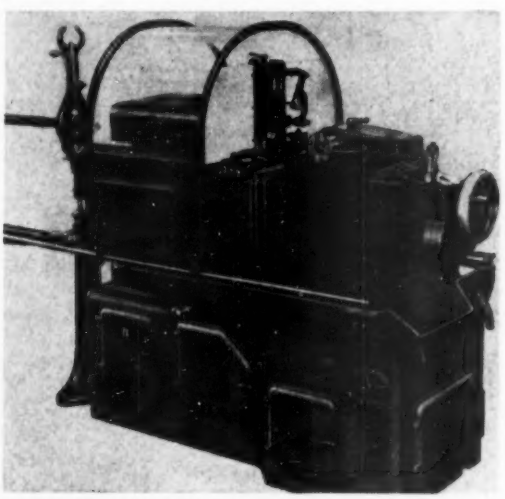
Increased Die Space In Emco Punch Presses

Emco line of bench power punch presses has been redesigned to afford increased die space by eliminating column radius. A new clamping device, consisting of tool steel block and bolt, has been introduced in ram, affording more rigid grip and doing away with setscrews. Model W has ¾- and 1¼-in. standard stroke. Model X has 1½- or 2-in. stroke. Capacity of W is 5 ton and speed is 300 rpm; capacity of X is 10 ton with 150 rpm.

The Klaas Machine & Mfg Co, 514 E 49th St, Cleveland 9, Ohio



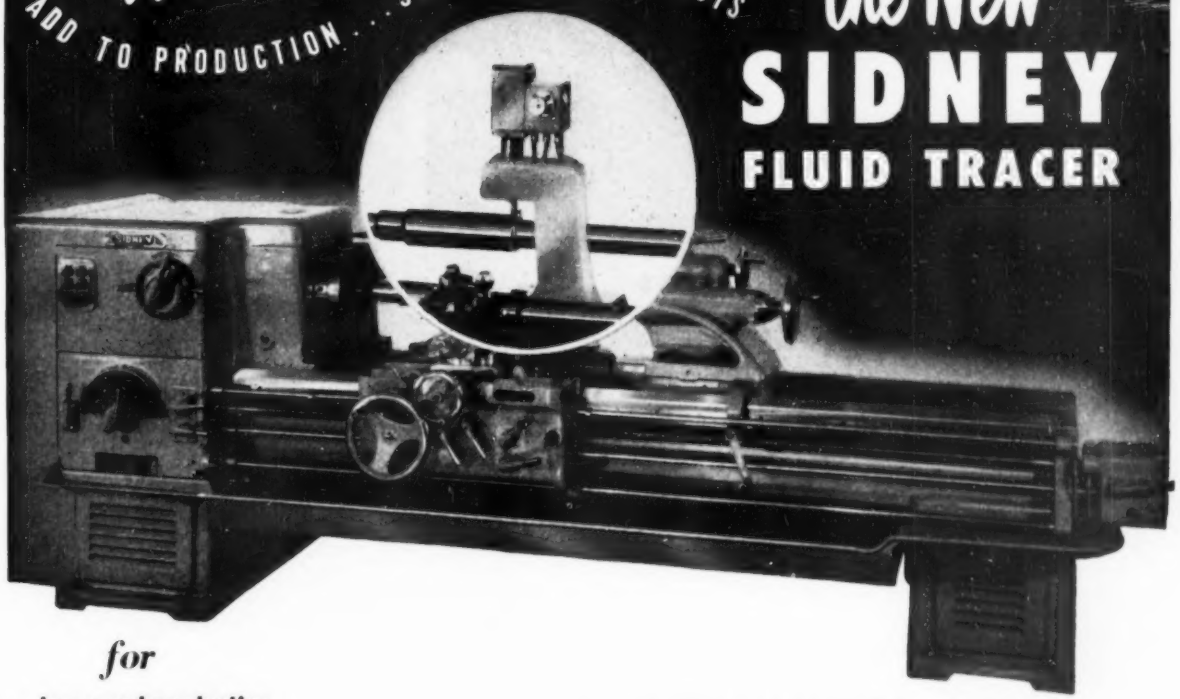
HEAVY-DUTY STRAIGHTENING MACHINE, designed particularly for handling hot-rolled bars and heavy-walled tubes, is said to be equally adaptable for steel and non-ferrous tubes. Tubes from 1- to 10-in. OD and bars from 1- to 6½-in. dia can be straightened at speeds up to 320 fpm. Any 4-to-1 ratio of speeds can be furnished. Machine operates on 5-roll principle; central pressure roll is located between two sets of opposed rolls. All major adjustments are motorized and operated from central control pulpit. Angular adjustment of driven rolls is shown on two dials — *Sutton Engineering Co, Bellefonte, Pa*



SINGLE-SPINDLE AUTOMATIC SCREW MACHINE, E H Jones model CVA 12, has ¾-in. capacity and 202 spindle speeds ranging from 63 to 5600 rpm. It is said to combine the speed and flexibility of a smaller model with rigidity and accessibility of a larger model. Spindle is driven by roller chains from gearbox with double-ended friction clutch providing automatic change of feed or direction — *Imported by British Industries Corp, International Machinery Div, 164 Duane St, New York 13, NY*

NOW... the New SIDNEY FLUID TRACER

ADD TO PRODUCTION . . . SUBTRACT FROM COSTS



for

- **increased production**
- **greater versatility**
- **wider range of work**
- **LOWER COSTS**

Here's an all-hydraulic controlled tracer with a DUAL PURPOSE . . . for tracing from round or flat template and regular lathe work with unlimited range for both.

Note how simple: just position one lever on clutch and brake unit to engage or disengage the tracer . . . that's all. No loss of time, no extra space, no parts to bother with, no extra expense for a single-purpose tool.

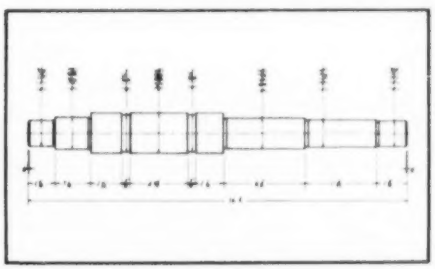
ABSOLUTELY SAME PRECISION ACCURACY AS WITH ALL SIDNEY PRODUCTS. Contour changes of the master piece are transmitted through the ultra-sensitive tracer valve as magically as if by an "electric eye" . . . even sharp shoulders are faced to amazingly close limits.

ADD the Sidney Fluid Tracer to any Sidney Model 32 Lathe. You'll enjoy the savings and efficiency of

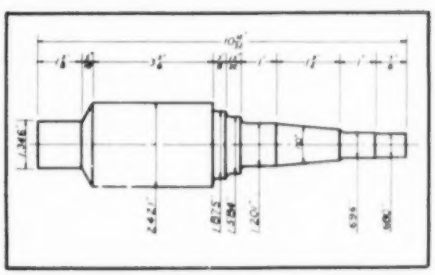
THE FINEST TURNING TOOL EVER PRODUCED

Please write for detailed literature or contact your nearest Sidney representative.

AMAZING SAVINGS THROUGH SIDNEY TURNING TIME

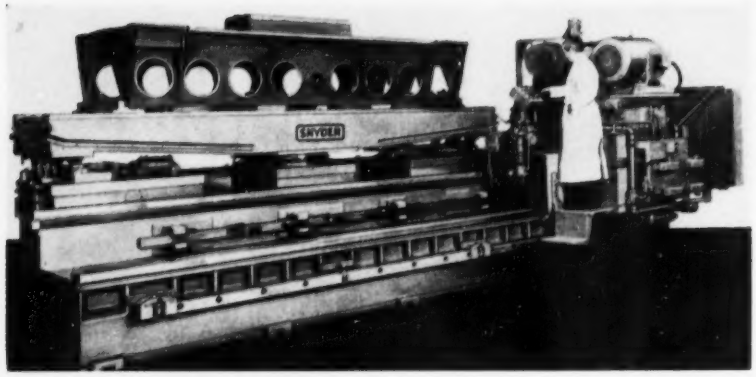


Normal Turning Time
4 hrs. 33 min.
SIDNEY TURNING TIME
38 min.
YOU SAVE
3 hrs. 55 min.



Normal Turning Time
25 min.
SIDNEY TURNING TIME
2 min. 31 sec.
YOU SAVE
22 min. 29 sec.

The SIDNEY MACHINE TOOL Company
Builders of Precision Machinery
SIDNEY — ESTABLISHED 1904 — OHIO



Machine Processes Oil Pans For Large Diesel Engines

Snyder machine processes welded-steel oil pans for large diesel engines. Parts are in four sizes and operations are boring and facing handhole openings in each cylinder centerline.

Rear section of machine base carries fixture centered on turntable which swings through 180° during work cycle. Hydraulically operated feed unit moves upon rails running length of base. Unit is indexed from station to station by fluid motor.

After loading, sequence consists of rapid advance, feed for boring, feed for facing, and rapid return. Operator has choice of manual or automatic operation. On automatic, after all holes on one side are bored and faced, operator pushes button to rotate part to do other side. On manual, each index and cutting cycle must be initiated by operator.

Because of difference in size of oil pans, reference point and full depth of feed are selected by means of dograil positioned by contact with part itself. Feed rate of spindle changes after boring from 1.60 ipm to 0.80 ipm for facing. Spindle speed changes from 80 to 40 rpm.

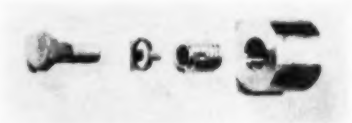
Snyder Tool & Engineering Co, 3400 E Lafayette, Detroit 7, Mich

Cuno High Pressure Filters Added to Micro-Klean Line

High pressure liquid and gas filters, series 1H and 1HG respectively, are available for operating pressures to 1000 psi. Construction is all-welded steel with head piece machined from bar stock. Pipe sizes for inlet and outlet connections are $\frac{3}{8}$, $\frac{1}{2}$, and $\frac{3}{4}$ in.

Guaranteed degrees of filtration through Micro-Klean cartridges are 10, 25, 50, and 75 microns.

Cuno Engineering Corp, Meriden, Conn



Locking System for Threaded Fasteners

Kelox method of fastening is said to be a simplified locking system for threaded fasteners such as inserts and studs. Positive locking against rotational action is accomplished with key ring which makes it possible to remove or insert stud without use of special tools.

Two keys, extending from bottom surface of ring, mate with keyway in stud. By interrupting helix continuity of threaded hole and threaded fastener, rotation is prevented. Torque tests have been successfully carried out on both ferrous and nonferrous materials.

Fasteners, Inc, One W 47 St, New York 36, NY

Teflon-Metal Adhesive

Flexrock No. 80 is an adhesive for binding Teflon to Teflon, or Teflon to metal and a variety of other metals. Pressure-sensitive product has a peel strength of over a thousand grams per in., or a direct pull of 12 to 15 psi, and is reported to have good acid and alkali resistance and excellent electrical properties. Applied by brushing, dipping, or spraying.

Flexrock Co, Packing Div, 3600-A Filbert St, Philadelphia 1, Pa

Split Roller Bearings Assemble Around Shaft

Cooper split roller bearings are split right down to the shaft and can be applied where it is impossible to mount conventional solid ball or roller bearings.

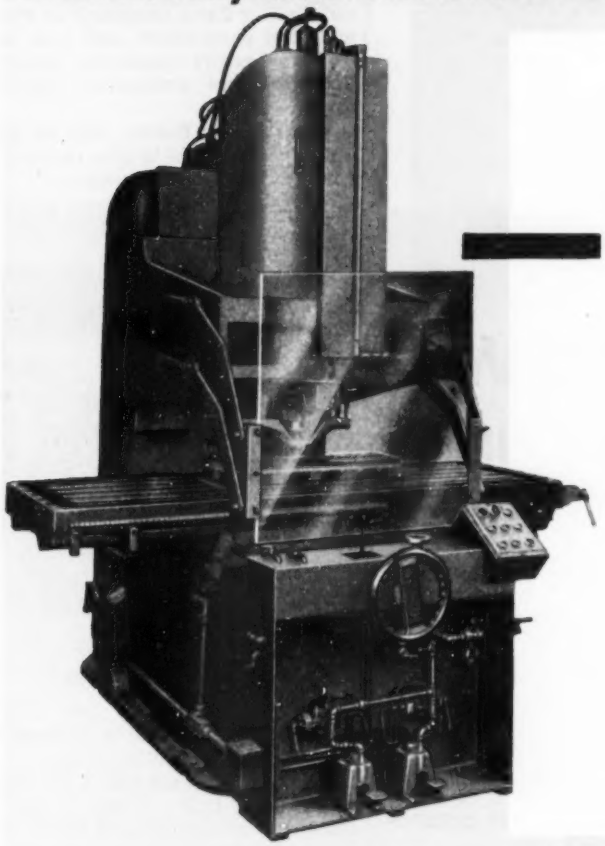
Races and rollers are high carbon-chrome alloy steel, through-hardened for strength and max load carrying capacity. Races are split on diagonal to insure continuity of contact area between roller and race. Cages are aluminum alloy. Cartridge and pillow block housings are stress-free gray iron castings.

Fixed type (grooved-race) are used as shaft-locating and radial-thrust bearings; expansion type (floating-type) are used to accommodate end play and shaft expansion. Bearings are housed in split cartridges in split pillow blocks.

Halves of inner race are clamped onto shaft with locking collars. Bearing assembly is completed by placing halves of outer race in position. Split cartridge or other split housing is fixed around bearing which is then ready for use.

Cooper Split Roller Bearing Corp, 700 Cedar Blvd, Pittsburgh 28, Pa

sensationally different! unbelievably fast! for milling aluminum



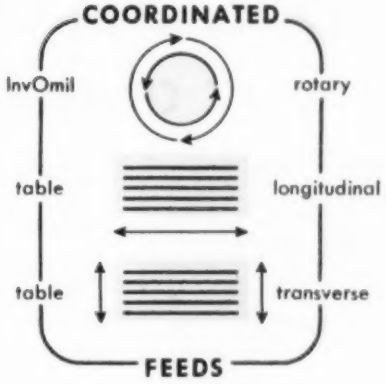
the new

Onsrud®

A-42

Profile Milling Machine

equipped with the famous
Onsrud patented system of



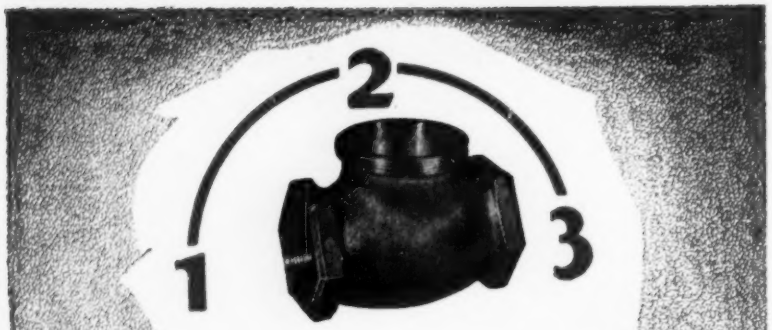
for hi-speed hi-feed nonferrous profile milling

Whatever the curve or the contour, here's the machine to give you production speeds never before thought possible. Automatic template-controlled precision . . . easily taught operation . . . production speeds up to 500% faster. Secret of speed is the coordinated triple power-feed of the milling head and table. Rate of feed is extremely fast without slow-up or stop in contour cuts or right angle corners. Direct drive cutter motor is Onsrud air cooled two-speed 15-30 HP, 7,200-14,400 RPM unit.

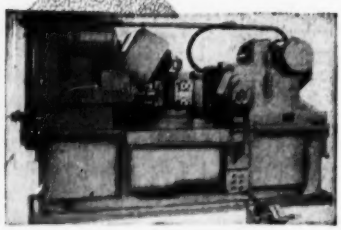
Designed and built under the same basic design principles as the larger capacity A-72 InvOmil Profile Milling Machine. For complete information . . . *write today for the new Onsrud A-42 Profile Milling Machine Bulletin No. 1145.*

FOR THE MILLING OF NON-FERROUS METALS IT'S Onsrud HI-FEED HI-SPINDLE-SPEED MACHINES

ONSRUD MACHINE WORKS INC. 3921 Palmer Street Chicago 47, Illinois



GOSS and DE LEEUW
AUTOMATIC CHUCKING MACHINE



means a complete piece... at each index cycle

When a piece is finished it is *completely* finished without the necessity of a second operation. Furthermore it means *more* finished pieces in a given period of time and greater accuracy in *every* finished piece.

The "1-2-3" Method is exclusive with Goss & DeLeeuw. With it, three ends of a piece can be machined at a single chucking of the work, simultaneously or in sequence depending on the operations involved. It will pay you to investigate.

Send for illustrated literature giving detailed information. Send samples and ask us to give you cost estimates of handling this work on a "1-2-3" Goss & DeLeeuw Automatic Chucking Machine.

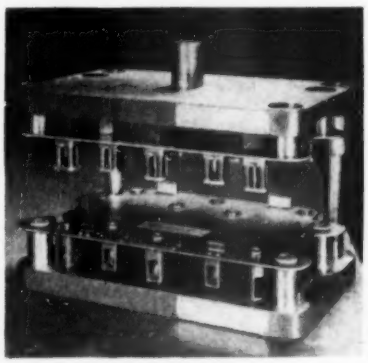
GOSS and DeLEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

Parcolac Finishes

Parcolac Black and Parcolac Aluminum are special finishes developed for use over Parco compound on iron and steel parts which may have to withstand severe exposure or operate under adverse atmospheric conditions.

Phenolic-type finishes, applied by centrifuge, are said to give excellent color and corrosion resistance.

Parker Rust Proof Co, 2177 E Milwaukee Ave, Detroit 26, Mich



Magnetic Perforating Dies Have Multiple-Use Features

Whistler magnetic dies have been designed for perforating materials up to ¼-in. thick mild steels.

To make up a perforating die, two blank templets are bored to admit the assembly of punch and die units. Upon completion of any one job, punch and die parts are removed, and templets can be stored for reuse; parts can be used in other templets in different arrangements.

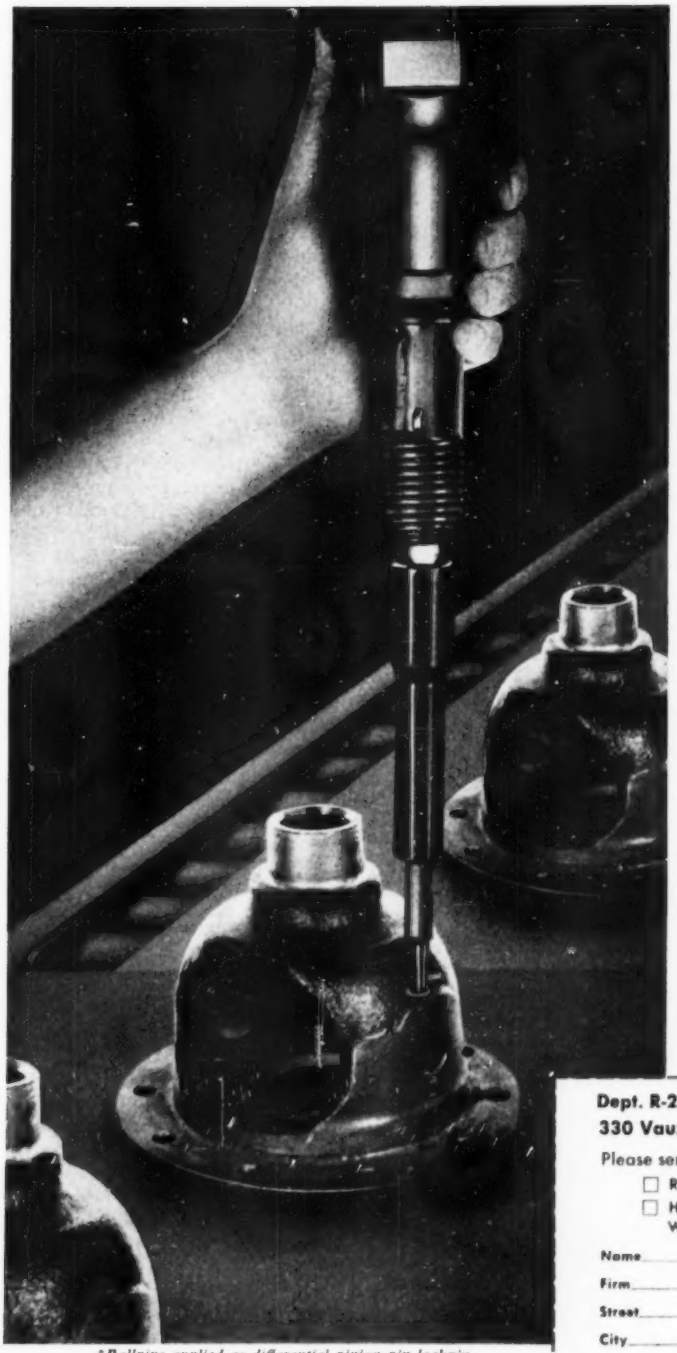
Units are available in standard sizes from 1/32 to 3-in.-dia, also in oval, square, and rectangle shapes; special sizes and shapes to order.

Equipment can be used in any press having a minimum shut height of 9½ in. Dies can be made up in almost any size desired. Blank templets with locator holes already bored can be stored; completely new perforating die can be ready for production within a few hours. Templets can be changed in the press without removing dieset; press downtime for making changes for an average-size job is said to be as little as ten minutes.

Working area of 12x14 in. will accommodate as many as 25 punches and dies perforating 25 holes from 1/16 to ½-in.-dia. Design is claimed to assure positive alignment of bushings. Tolerances can be held to 0.0005-in. accuracy, or as close as can be jig bored.

S B Whistler & Sons, 744 Military Rd, Buffalo 23, NY

Ford Cuts Assembly Costs using ROLLPIN TRADE MARK



**Rollpins applied as differential pinion pin lockpin on the Ford Motor Mound Road Plant assembly line.*

Rollpin is the slotted tubular steel spring pin with chamfered ends. Simply drive it into holes drilled to normal production tolerances. It compresses as driven—and its spring action locks it in place regardless of impact loading, stress reversals or vibration.

Rollpin assembly eliminates extra operations and parts. There is no precision drilling, threading, peening—and no cotter pins or other locking devices. Cost savings as great as 90% result—depending upon the type of fastener replaced and the assembly method now in use. Our illustration is an air gun set-up that installs Rollpin at the rate of 8 units a minute on the Ford assembly line.*

Other insertion procedures range from simply driving Rollpin with a hammer to more intricate hopper-fed methods. Independent time studies have shown installed costs of Rollpin at 9% of that for a dowel pin and *less than 5%* of the installed cost of a taper pin.

Mail our coupon for information on how Rollpin will do your fastening faster and cheaper.

ELASTIC STOP NUT CORPORATION OF AMERICA

Dept. R-23-109, Elastic Stop Nut Corporation of America
330 Vauxhall Road, Union, New Jersey

Please send the following free fastening information:

☐ Rollpin bulletin ☐ ELASTIC STOP® nut bulletin

☐ Here is a drawing of our product. What ESNA® fastener would you suggest?

Name _____ Title _____

Firm _____

Street _____

City _____ Zone _____ State _____

The RIGHT SELECTION pays off in Grinding Wheels too!

SIMONDS ABRASIVE CO.

Grinding Wheels

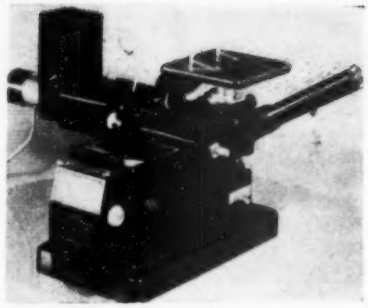
In buying wheels . . . as in hiring men . . . intelligent selection pays off in production. Simonds offers you productive grinding wheel selection in three ways: (1) through our free data book with wheel specifications for all your grinding jobs . . . plus information on Simonds complete line, including grinding wheels, mounted wheels and points, segments, polishing grain: (2) through Simonds field engineering service, ready at any time to help you get wheels for your specialized jobs: (3) through your Simonds distributor—constantly abreast of the latest developments in industrial grinding,and equipped to supply you promptly with Simonds wheels for superior results.

Write for data book and name of your Simonds distributor.

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON

DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N.Y. Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.



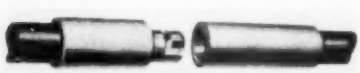
Microscope-Metallograph Operates in Small Work Area

CSF metallurgical microscope and metallograph occupies 1/10 to 1/20 of the space normally used by such instruments. Group observation of the specimen is made possible by projecting the light beam through the camera housing onto a screen.

Inverted design confines all operations to a 13x8x8-in. area. Unit permits visual observation at all magnifications up to 1000x, and photographic and projection observation up to 1500x. A 2½x3½-in. reflex camera is supplied which takes both plates and roll film.

CSF is provided with two dry objectives for low and medium magnifications and one oil immersion objective for high magnifications, individually mounted and centered on interchangeable slide holders. Standard magnifications of 50, 75, 100, 200, 500, 1000, and 1500x, as well as intermediate values, are available. Unit is equipped with rack and pinion device for coarse focusing and a micrometric movement for fine focus registering to two microns. Instrument can be supplied with Polaroid back, making photographs of specimens available in 60 seconds.

Imported by Opplem Co, 352 Fourth Ave, New York 10, NY



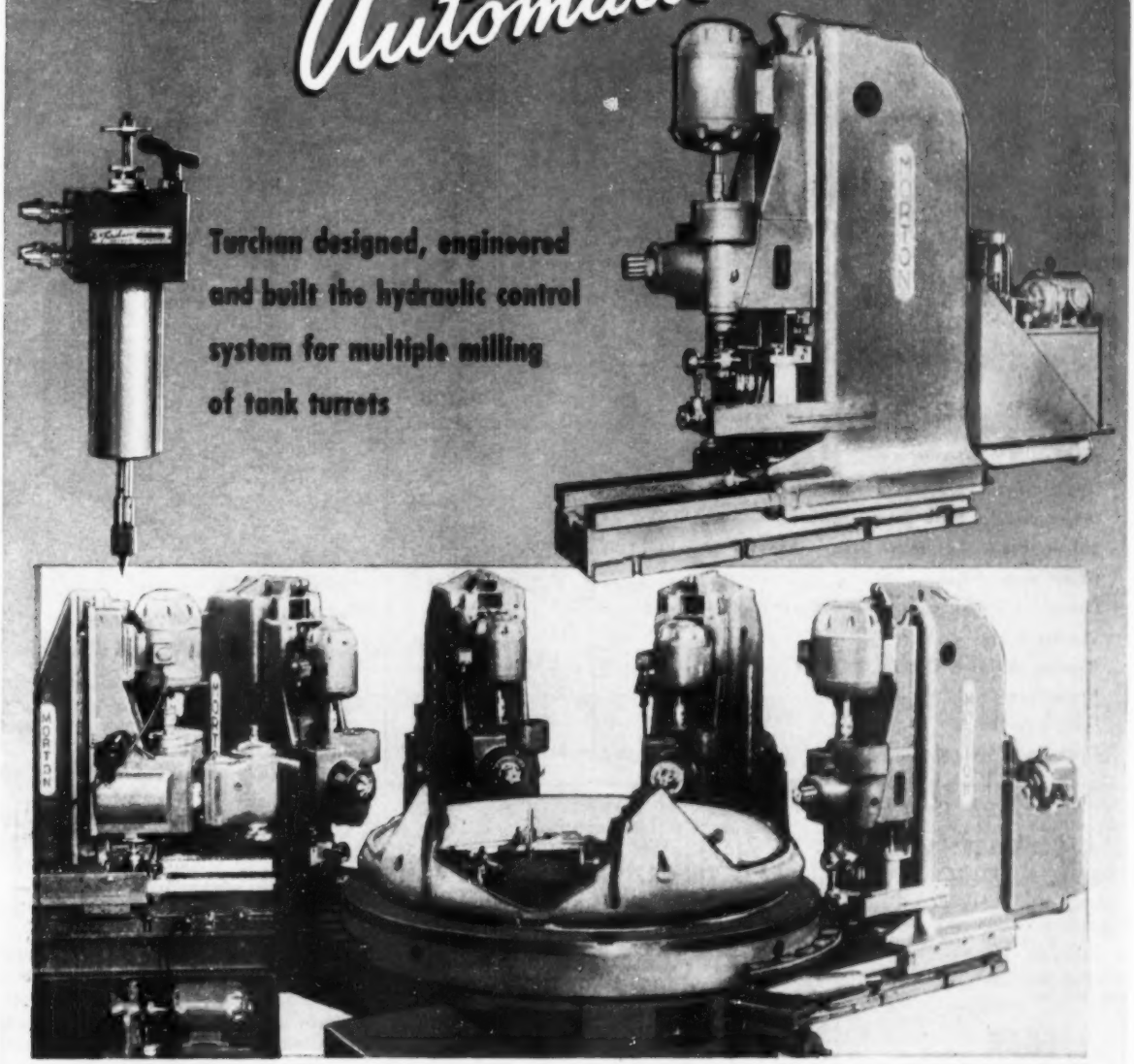
Welding Cable Connector

Cam-Lok welding cable connector consists of a double cam principle: one cam exerts pressure parallel to the axis of the connector, the other perpendicular to the axis. Contact approaching the 600 psi needed for minimum resistance is obtained.

General purpose connectors for 1/0 through 3/0 cable and No. 2 through 1/0 whip ends, are completely interchangeable with heavy-duty connectors and with general purpose and heavy-duty female terminal con-

Turchan has what industry needs in the trend to Automation

Turchan designed, engineered and built the hydraulic control system for multiple milling of tank turrets



Milling of tank turrets at the Cadillac Tank Plant in Cleveland, Ohio was simplified by installation of this battery of standard milling machines equipped with Turchan hydraulic tracer controls. The entire hydraulic system, including power unit, hydraulic drive, and servo valves was designed, engineered and built by Turchan to meet the special requirements of milling tank turrets. Workpiece is mounted on rotary table, templates are affixed to the outside rim of table.

Machine control problems? Turchan specialists can help you! Send a sketch and specifications for job analysis.

Turchan FOLLOWER MACHINE CO.

Machine Tools Division, 8259 Livernois Avenue, Detroit 4, Michigan

Does this PRESS-RITE 30 TON POWER PRESS FIT YOUR REQUIREMENTS?

SPECIFICATIONS	NO. 3-30 TON
Diameter of Crankshaft at Bearing and Pin	3"-4"
Standard Stroke	2½"
Longer Stroke at Extra Charge, Maximum	4"
Distance Bed to Slide, Stroke Down, Adjustment Up	10"
Bolster Area—F.B.xR.L.	13¾" x 23¾"
Distance to Back from Center of Slide, or Depth or Throat	7"
Opening in Back	11"
Diameter of Hole in Slide for Die Shank	2" Round
Flywheel Speed, R.P.M.	120
Motor Required	3 HP 1140 RPM
Floor Space Required, Floor Model	35" x 38"

A COMPLETE LINE FROM 5 TO 85 TONS

This 30 ton Press-Rite Inclinable Power Press may fit your job to a "T" . . . or you may require a smaller or larger unit.

Whatever your needs, Press-Rite is your best buy!

FREE . . . ENGINEERING SERVICE

Send in your specs or a sample part for our experienced engineers' recommendations. It assures you of the right press for your job, and there is no obligation on your part.

MORE OF THE PRESS FEATURES YOU WANT

Typical of the Press-Rite line, you will find more features in a single press that help you keep reduction at a high level with a minimum of maintenance, and set-up time. Bronze bushed main bearings, greater die space, rugged alloy frame, roller bearings in flywheel, automatic cam actuated brake, single stroke safety mechanism, and 4 point drive ring are standard on all models. Air clutch is also available at extra cost.

Let us mail you this Press-Rite catalog. Complete specifications on all models.

Sales Service Machine Tool Co. SSM

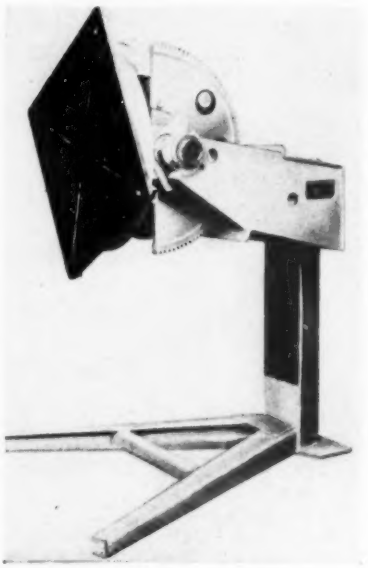
PRESS RITE PRESSES • SHAPE RITE SHAPERS • KELLER POWER HACK SAWS

2347 UNIVERSITY AVE. ST. PAUL 4, MINNESOTA

nectors. Long runs of cable can be graduated from 4/0 down to a light whip end for maximum flexibility and minimum voltage drop. No adaptors or reducers are needed.

Unit, made of solid brass machined to a smooth sliding fit, is self-compensating for wear, locks tight, releases easily, has no spring action, and reduces arcing and burning to a minimum.

Cam-Lock Div, Empire Products, Inc, PO Box 98, Cincinnati 36, Ohio



Welding Positioners Have Special Variable Speed Drive

Heavy-duty precision positioners for automatic or manual welding have been introduced in 2500-, 3000-, and 6000-lb capacities.

Units are equipped with a special variable speed drive of differential type, with all components mounted on ball bearings; drive provides stepless change from zero to predetermined top speed. An accurately calibrated hand wheel or electric remote speed control is provided.

Table is driven by a spur gear and pinion for minimum backlash and accurate adjustment; reducer is bolted to the yoke so that gear mesh adjustments can be easily made. Built-in high capacity ground gives resistance-free return of welding current, resulting in more uniform welds. Table tilting speed is 135° in 40 seconds; height is adjustable in 6-in. steps for handling various sizes of work most effectively. Tilt indicator is standard equipment.

Positioners are mounted on heavy-duty steel posts, or can be mounted on columns or walls by eliminating the post.

Worthington Corp, Harrison, NJ

any time, any place . . .

REX HIGH SPEED STEEL *is always the same, too*

You get the same outstanding performance from every Rex product no matter where or when you buy it. That's because every heat of Crucible Rex High Speed Steel is given a careful metallurgical laboratory examination to insure that each piece meets Crucible's high standard of uniformity.

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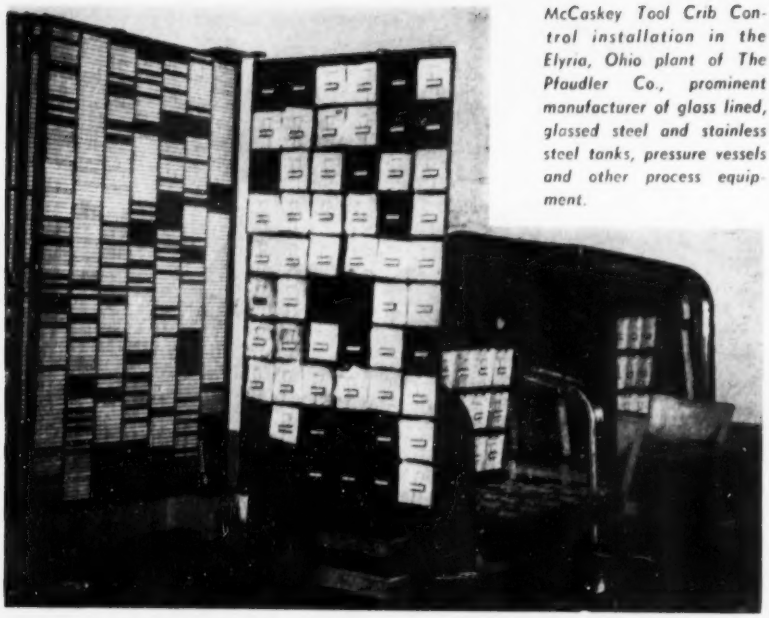

McCaskey Tool Crib Control installation in the Elyria, Ohio plant of The Pfaudler Co., prominent manufacturer of glass lined, glassed steel and stainless steel tanks, pressure vessels and other process equipment.

THE PFAUDLER CO. another plant to report *Quick Return* on their investment in McCASKEY TOOL CONTROL

Mr. C. S. Rieley, Chief Industrial Engineer of The Pfaudler Co., Elyria, Ohio, states:

"McCaskey Tool Crib Control was installed here in 1950. Tool purchases were reduced $1800 during the first year.

"At the start of operations 3,757 expendable tools such as drills, taps and reamers having a value of $5375 were turned in to the crib. In addition, more permanent types of tools such as chucks, boring bars, sleeves, etc., valued at over $3000 were recovered.

"Another significant saving resulted from elimination of idle machine time while operators searched for tools.

"The McCaskey Tool Crib system provides us with fast, reliable service, allows the attendant ample time to regrind and maintain the tools in properly sharpened condition, keeps tool stocks at a workable minimum and helps reduce breakage through simple control records.

"SAVINGS IN REDUCED TOOL PURCHASES ALONE IN THE FIRST FEW MONTHS PAID FOR THE ENTIRE INSTALLATION."

Mail coupon for further evidence that McCaskey Tool Crib Control quickly returns its first cost in continuing savings in plants both large and small.

McCASKEY REGISTER CO.
ALLIANCE, OHIO

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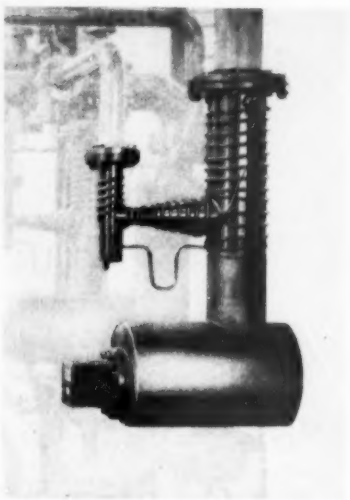
Splinemaster pitch line concentricity arbors, and chucks are offered as the answer to machining and inspection problems where there must be close control of tolerances from spline pitch diameters to face, shoulders, bores, and external or internal pitch dimension of gears.

Units were designed to be manually or draw-bar operated and are engineered for customer's particular application, whether spindle-mounted, face-plate, between-centers, or inspection gages. Smallest size is 0.500 PD.

Splinemaster Products Div, Great Lakes Broach, Inc, 25800 Groesbeck Highway, Roseville, Mich



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Ejector diffusion pump, type KS-600, is designed to produce a high pumping speed over pressure range of 0.001 to 0.005 mm of Hg. Particularly useful in vacuum metallurgical processing systems, its operating features are said to make it adaptable to many other high vacuum applications, such as dehydration and vacuum metallization.

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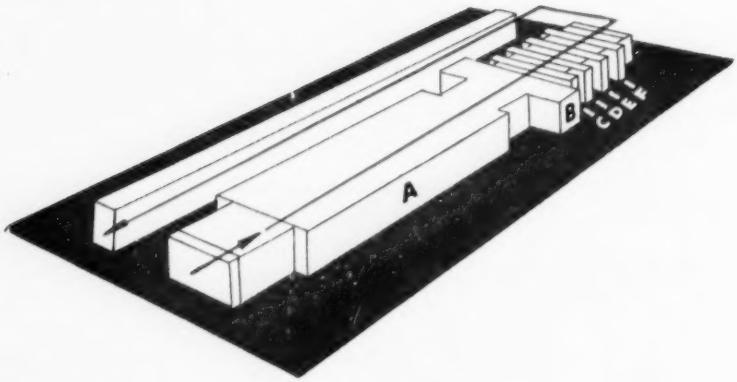
Heat Treat Furnace Layout by Holcroft... 2nd of a Series



A Annealing furnace
B Hot salt quench
C Wash
D Acid bath
E Wash
F Oil dip

Volume Production Castings Annealed, Descaled, Desanded

This "U-type" furnace layout by Holcroft ties right into the production line of a large automotive plant.

The unit anneals, descales and desands 10,000 pounds of castings each hour. After annealing, the stock is dipped in a salt quench, rinsed in water, bathed in acid, water-washed again, and dipped into a soluble oil to prevent rust. A return conveyor automatically brings the trays back to the loading point.

Unusual layouts like this present no particular problem for Holcroft. After all, it's an inherent part of the job to be completely responsible for the work—from the time it is to be heat treated to the time it's ready for finishing operations. It's the type of work Holcroft does well. Holcroft & Company, 6545 Epworth, Detroit 10, Michigan.

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ROUND TABLE *Discussion*

SALARY NO SECRET

Should a man's earnings be his private business? Will public knowledge of each worker's wages quiet curiosity or tend to arouse resentment among the men? Some readers say . . .

IN MY OPINION, open wage rates are better than secret ones. Men work for a variety of reasons besides that of making money. Just as many work under an open wage rate as a secret one without giving it a second thought. Of course people seldom toil for the mere love of work; it is fairly generally conceded that they must have some incentive at any task or occupation. Whether there will be an incentive if a worker knows that his neighbor is making more money than he is appears problematical; it depends on the individual.

I do not approve, however, of tagging each worker with a number indicative of how much he makes. The determination of proper wage rates on a scientific basis does not necessitate that kind of publicity. It should be the duty of management to let every worker know what the base rates of pay and the differentials are that make up the total pay for the different jobs. It should not be necessary to have the men go around as No. 1 or No. 3, etc, as examples of the different categories of wage rates they are receiving.

Good management uses job and man rating to provide the key to a fair basis of payment. In my opinion, the time basis of payment is the most desirable, provided it is used only after careful determination of job requirements and the measurement of worker performance. In the determination of job requirements and the measurement of performance the techniques of job evaluation and merit rating should be applied. Job evaluation may be used to determine the base rate or that portion of the wage system which is paid any person who meets the minimum requirements of a job. It is the portion paid for the job and not the employee who fills it. To this may be added a differential which is the portion of the wage which makes allowance for individual differences in filling a job. It distinguishes between job requirements included in the base rate and what the worker is, how completely

he fills the job, and his general value to the company; attitude, versatility, loyalty, etc. If careful records of each man's activity are kept, and periodic adjustments made in the wage scale, the so-called measured day work results. When job evaluation and merit rating are used as a basis of determining rate of pay, the worker is assured of scientific determination of how much he is entitled to in wages. There is no need for categorical rates of pay by numbers as indicated in the case under discussion. Every worker will know what his rate of pay is based on, and how he can earn the maximum he is worth.

Time alone as a basis of payment has this disadvantage—time itself does not measure effort or results, but only the presence of a man on the job. When time spent on the job is the only basis of payment, individual employees may feel it is not worth while to work harder than fellow employees because their additional effort will not receive immediate recognition in the pay check. Their wages remain the same as long as they are merely present on the job; their attitude often expressed is: "So why not take it easy?" Since the time basis of payment does not encourage men to work hard, it becomes the responsibility of foremen and supervisors to keep men working. The foreman must act as a policeman, checking up on the men to see that they are busy, as well as telling them how and what to do.

When job evaluation and merit rating are used as a basis of determining rate of pay, the steps to be followed are: motion study to establish standards of output and procedure; job analyses and specifications to establish job requirements; the use of job evaluation to determine the relative importance of job requirements and the base rates to be paid for these; and employee (merit) rating to allow for individ-

"They're not really concentrating. It's just that neither one of them wants to admit that he can't read prints."

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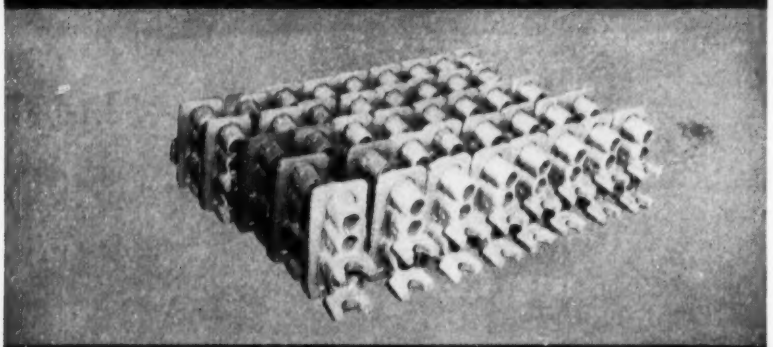

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You, too, can get *quick* deliveries on castings as clean and smooth as the intricate diesel-engine valve guides in the lower photo. For details about the 110 brass and 20 iron alloys available, write Dept. 5702, Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.

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ual difference in fulfilling job requirements. Job evaluation and merit rating in practice demand a periodic review of base rates and differentials because jobs change and individuals change in the performance of their duties.

The incentives to the individual to perform useful work in industry fall generally into three classes; financial, extra-financial, and non-financial. In the first group are those payments which are directly related to the time spent on the job, or the number of units of product turned out, and include wages, overtime pay, and piecework bonuses. The second group comprises money payments which do not depend on these criteria, but on company profits (profit-sharing and year-end bonuses), and premiums for meeting or exceeding quality standards. The last category of incentives includes all the means by which management seeks to improve morale, increase production, reduce costs and, in other ways, persuade employees to work willingly and efficiently. Examples of this type of incentive are promotional opportunities, good supervision, training, praise, and a sense of status. Publishing of wage rates is, therefore, a minor means of incentive for workers. "Man does not live by bread alone; it's the butter that adds the enjoyment."

It has been found that one of the most prolific sources of employee grievances is the failure of foremen to keep workers informed of their status under merit-increase plans or to initiate rate-increase recommendations on schedule. If a worker is entitled to an increase, either on merit or seniority, it is wholly unjustifiable that he should have to seek out his supervisor and ask for it. He is entitled to know why he is not to receive a merit increase, if there is sufficient justification for deferment, and he is also entitled to all the help

MACKLIN

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management can give him in correcting the deficiencies which led to the deferment. It is the foreman's responsibility to give such information and help to his employees.

The secret of getting employee cooperation and higher worker efficiency does not depend on secret or open wage rates, but on more dominant factors in the work situation. These factors that affect the employee's morale and willingness to work efficiently are many and varied. If people are unhappy or dissatisfied, they will not put forth their best efforts. Morale is a fragile thing and is affected by subtle influences which frequently are hidden in the everyday activities of managerial and supervisory personnel. Employees like to feel that they are important, that their duties are a necessary part of the productive process, that management recognizes their intrinsic worth and they like to be consulted about decisions which affect them. Above all, workers want intelligent leadership, definite responsibility, a reasonable expectancy of job security, and promotional opportunities. When these happy factors exist in a work situation, there is no need for dependence on publicizing workers' earnings as incentives to greater efficiency and productivity.

Harry Kaufman
Philadelphia, Pa

•

COFFEE BROKE

Does the coffee break tend to increase or break down shop morale? Should the tendency of some workers to take advantage of the alloted time warrant elimination of the practice entirely?

THE IDEA OF THE COFFEE BREAK was originally based on a recess of time from labor as being an aid to greater production through a period of relaxation for the employees—whether it be coffee, milk, or a snack from the nosebag. It was decided that greater efficiency would ensue if a short break session were given to employees, in mid-morning and mid-afternoon, so that they would be able to start in with a freshened body and mind at the end of the period.

Unfortunately, things have gone beyond the period and it has now become an extended session of dwindling away valuable minutes that rightfully belong to the company. In my observations during the past year I have taken particular note of the working of this coffee time, and have come to the conclusion that it is considerably abused—

first again!

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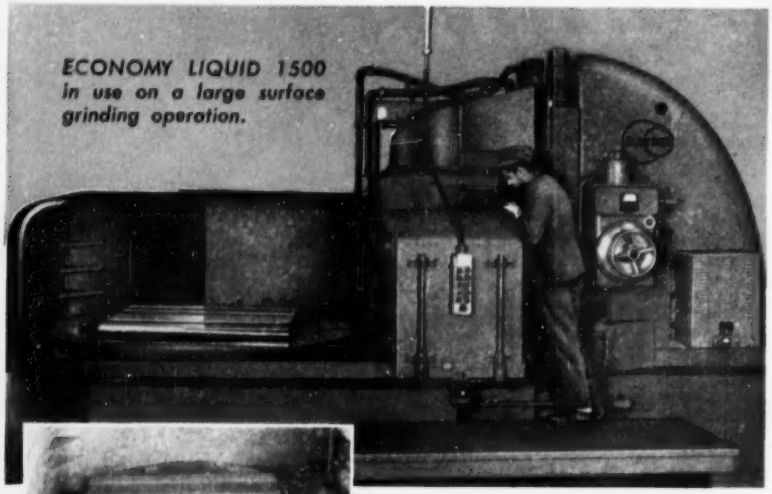
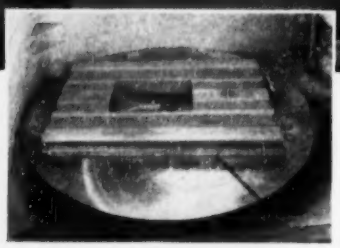


ECONOMY LIQUID 1500 in use on a large surface grinding operation.



The large piece set up on the 85" chuck, ready for grinding.

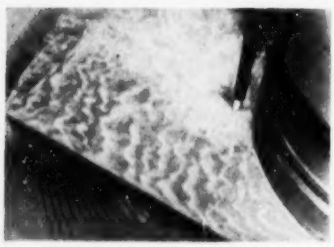


Photo shows actual grinding operation in progress. Operator can see the work, gauge blocks or crayon marks through the green, transparent coolant.

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Originators of Grinding Lubricants

just as the idea of no-clock-punching has resulted in employees entering for work after starting time. It certainly resolves itself into what Al said: "Give a man an inch and he'll take a mile."

I am not an employer—in fact I am a retired worker who has always tried to be fair to both labor and management. If ten minutes is allowed the workers for the purpose of relaxation, why shouldn't they renew their activities at the end of the period? I have taken note of the attitude of the employer and that of the worker. Understand, I am not laying the blame for this coffee-hour abuse on all the workers. As in almost everything else, there are a certain few who are guilty of dragging out the "sugar time" and this leads others to follow suit.

In a plant where it is left to the individual to return to his regular work this practice of lolling along is particularly noted. The conscientious individual who would resume his work on time hesitates because he fears that he will be looked upon unfavorably by some of the group.

I heartily recommend that the coffee period be brought to an end with the ringing of a bell or a whistle blown with a full head of steam. I am afraid that if the abuse is not remedied it will go down in history as something that was good while it lasted. Too many conscientious workers do not seem to have the stamina to resume their work as they should, and, in time, become just as lax as the trouble makers.

A cup of steaming coffee is a sound pickup and can, by its abuse, be a regretful letdown when the employer's patience becomes exhausted.

Harrison Mitchell
Topeka, Kansas

"The wife and I divide my pay—only I take the straight time and she takes the overtime!"

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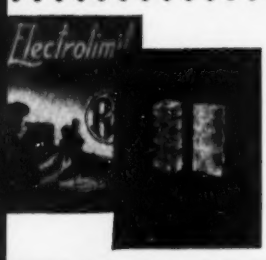

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So ED TAKES EXCEPTION to the boys having a refresher now and then; it seems that he is not heartily in favor of it, according to his remarks.

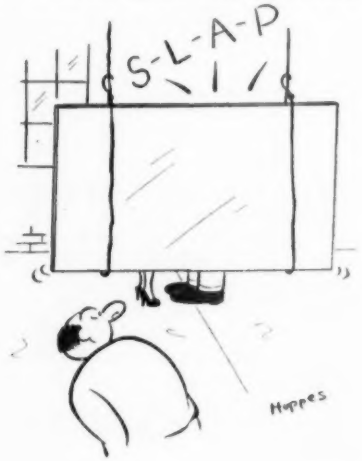
Have you forgotten, Ed, my ultra-conservative friend, whose thinking seems to follow the old rut of harnessing the worker with a yoke, when the worker toiled on unceasingly from starting whistle to quitting time, so worn out at the end of the period that they were fit to be tied? Do you remember when they grunted and groaned with logginess when they picked up their lunchbox from the bench?

The coffee hour was originated by some brilliant thinker for the purpose of affording the workers a respite from their labors—to give them a period of relaxation that would enable them to carry on for the remainder of the period.

If I had my way, I would establish a five-minute period of relaxation at starting time. I don't mean to use this period to flood their innards with java; my purpose in this is on account of the mad rush that employees usually have to put up with when traveling from their homes. Often one isn't in a very good frame of mind to jump in and perform the best work. One can readily see the effectiveness of this period of normalization in that it neutralizes any frustration caused by bustling traffic or domestic irregularities.

The "blind" employer will probably say, "Hell's fire, why can't they have it on their own time? What in hell are we running around here—a psychological laboratory, or is this a production plant?"

Well, to comment on the former of these objections let me point out that this "normalizing" period is not only for the employee's benefit; it is primarily for the benefit of the employer in that it enables the worker to direct all his energies toward



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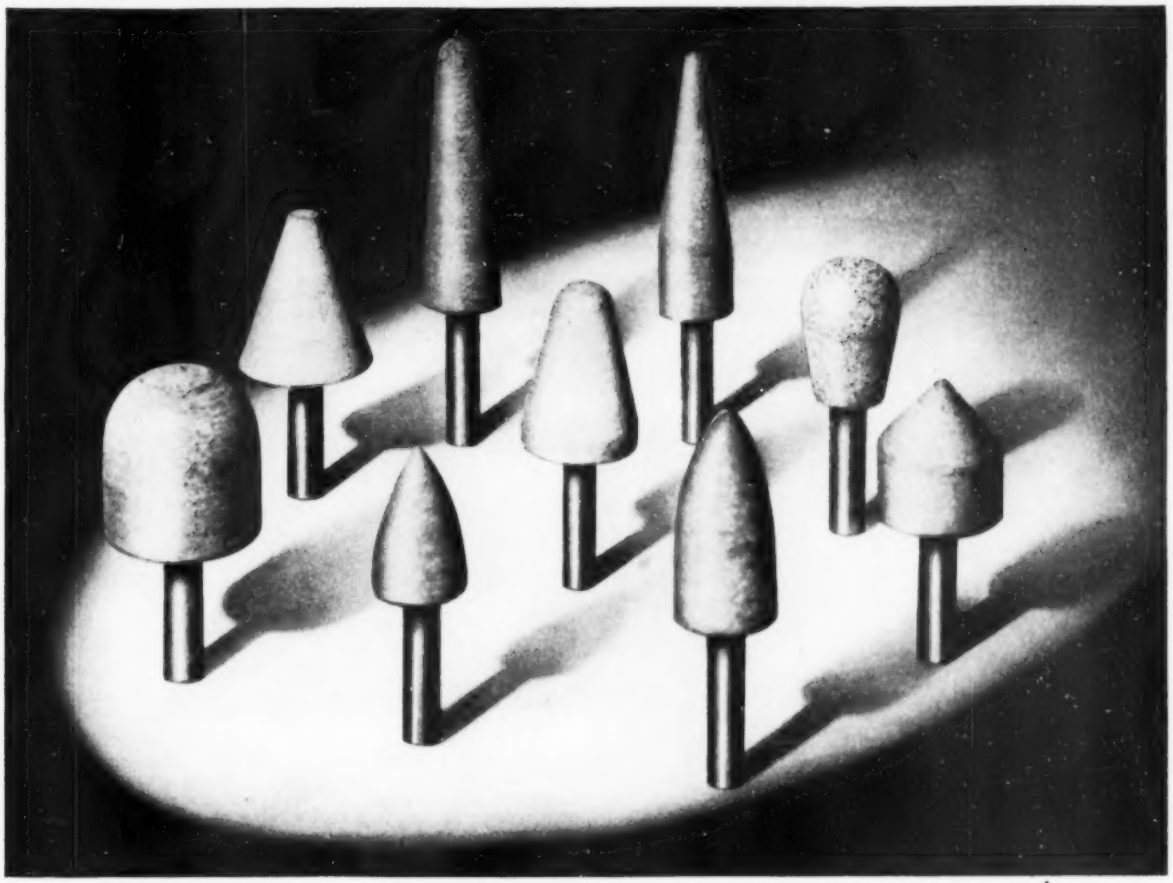

assure finer finishing at lower costs

Here's how NU-TEX points can save you time and money on hundreds of precision finishing jobs.

CLEANER, FASTER GRINDING POLISHING AND DEBURRING

Unlike other mounted wheels, new, longer lasting NU-TEX Mounted Points will grind, polish and deburr all types of metals and plastics *in one simple operation.* Their soft, cushion-like action produces even, extremely smooth finished surfaces quickly and easily . . . eliminates the need for filing, scraping, sanding or burnishing . . . speeds up production on all types of precision instruments and machinery.

FEWER REPLACEMENTS, LESS DOWNTIME

Bonded together with a special resin under an exclusive manufacturing process, NU-TEX Mounted Points assure a longer life and better polishing and deburring action than any other product of their kind. Reliable tests prove that NU-TEX Points last longer under continuous operation . . . cut cleaner and smoother . . . eliminate clogging or loading, even on softer metals.

PROMPT DELIVERIES, WIDE SELECTION

When you specify NU-TEX Mounted Points, you eliminate costly shipping delays . . . get prompt service on every order . . . choose from a complete line of popular grit sizes for every purpose. Try them and see. Write now for descriptive folder. Or, better yet, have a NU-TEX Representative show you these new mounted points in action . . . saving time and money *on the job!*

ATLANTIC ABRASIVE CORP.
South Braintree 85, Massachusetts

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ATLANTIC ABRASIVE CORP., 516 Pearl Street
South Braintree 85, Massachusetts

- *Please send me descriptive folder*
- *Please have your NU-TEX representative call*

Name _____

Company _____

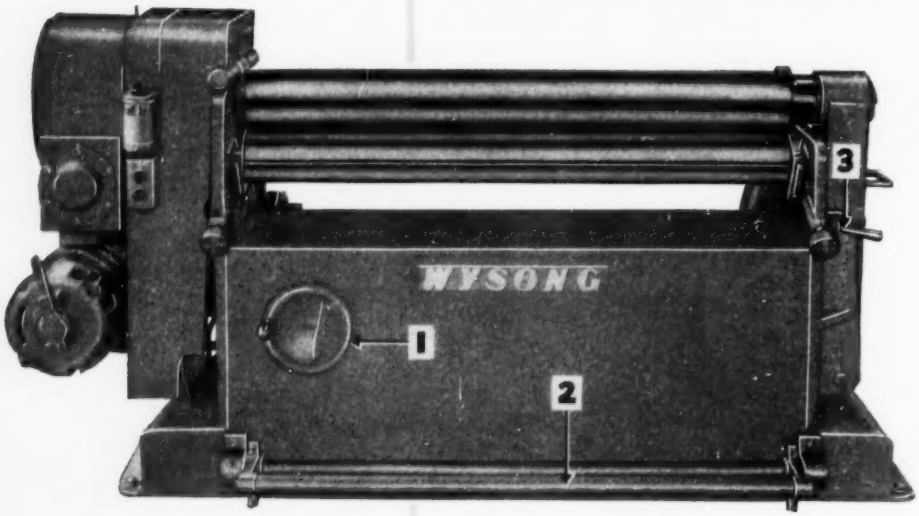
Street _____

City _____ State _____

3 new features

ARE STANDARD ON WYSONG ALL-STEEL 5 INCH BENDING ROLLS

1. **Fast, parallel adjustment of rear roll with single handwheel on front of machine. Easy to read roll setting indicators are clearly visible. Saves set-up time. Saves steps.**
2. **A safety treadle extending full length of machine. Depressing the treadle from any front position immediately stops the machine. Machine is reactivated at push button station.**
3. **A single lever releases drop-end. Lowering drop-end causes top roll to lift for easy removal of finished work. In top position drop-end locks securely and provides a support for top roll.**



Wysong all-steel, 5 inch bending rolls are of the initial type. Frames are all-steel weldments. Rolls are accurately machined alloy-forgings. All rolls are power driven. Main gear drive runs in a continuous bath of oil. Drive is by V-belts. Drum control provides forward, reverse or neutral.

Optional features include: Power operated drop-end; Magnetic brake for main motor to prevent overtravel of rolls; Magnetic starter and push button control for main motor; Power adjustment for rear roll.

Made in 36" x 3/16", 48" x 8 ga., 60" x 10 ga., 72" x 12 ga., and 96" x 16 ga. sizes, Wysong all-steel 5 inch rolls are high production machines, equipped with time saving and safety features. It will pay you to compare these rolls with any other on the market before you buy. See your dealer or write to the factory for full information.

WYSONG

PRECISION METAL WORKING MACHINERY

WYSONG ALSO BUILDS
Power Squaring Shears
Air Power, Foot Power Squaring Shears
Hand Operated Slip Roll Formers
Rotary Combination Machines
O. B. I. Presses

WYSONG AND MILES COMPANY
Greensboro, North Carolina

Buy A Wysong . . . It's Miles Ahead

production and quality. As to the second objection raised by the irate employer, I might retort with the convincing claim that he is running a production establishment which will be far more efficient, and where a greater degree of harmony will prevail, if he uses a little sound third-grade common sense to promote that end.

True it is, as Ed points out, that some of the workers are taking advantage of the coffee hour and doing their damndest to extend it to unfair limits. We cannot judge the majority of the workers—an overwhelming majority at that—by what a miserly few in comparison choose to do. In everything we do you'll always find a few who by their action try to interfere with its perfect working. If you will but keep your watchful eye on this advantage-taker for a while you'll see that, were the coffee-hour not in effect, he would still exercise his time-killing wastefulness in one way or another. The advantage of the coffee-hour in this instance is that it exposes the ones guilty of dishonesty and selfishness.

Some of the workers are under the delusion that the coffee-time was given to them for their express benefit so that they could have a moment of rest. Not on your life was it conceived toward that end! The main reason behind the whole idea is that of production. Greater production through more effective working conditions caused by the relaxed employees who, because of a few minutes of respite are enabled to do better work.

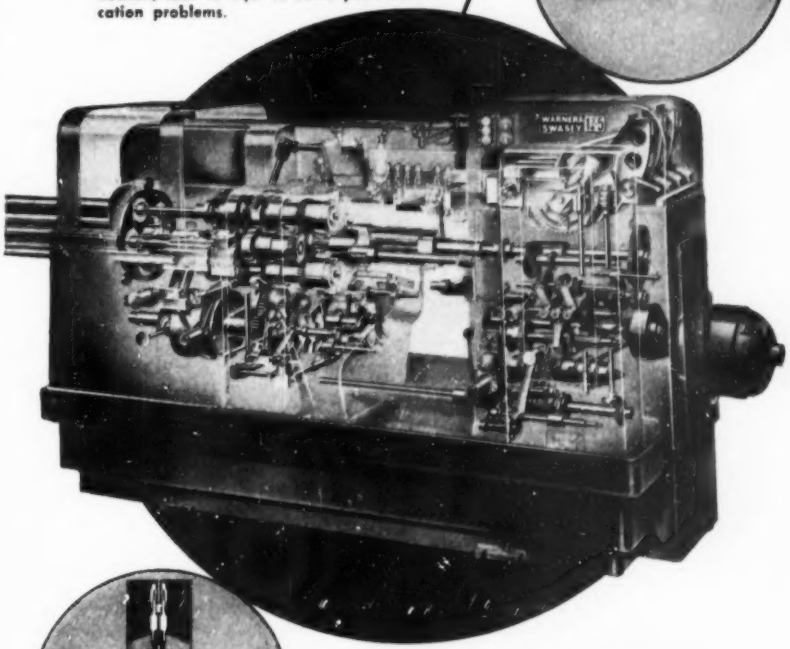
Ed's estimate of time wasted could be somewhere near correct. I cannot believe it myself so let's do a little figuring. Let us say that a man works fifty-two weeks a year and puts in forty hours a week. This amount divided into eighty hours—the time

"The shop foreman would turn out to be my old teacher from grade school!"

PRODUCTION *Plus with* BIJUR / LUBRICATION*

Modern machine tool manufacturers take justifiable pride in building constantly increased production and accuracy into their machines. As rates and standards increase, adequate lubrication becomes essential. To safeguard 41 important bearings on their 5-Spindle Automatic Bar machine, Warner & Swasey, one of America's leading manufacturers, *standardizes on Bijur* lubrication. Because Bijur delivers predetermined, *metered* lubrication *automatically*, the number of manufacturers and users who specify Bijur as standard equipment is constantly increasing throughout industry.

If you're looking for longer machine life, lower maintenance, and increased production, look to Bijur to solve your lubrication problems.



*** Standard Equipment on Warner & Swasey's 5-Spindle Automatic Bar Machine**

N-11

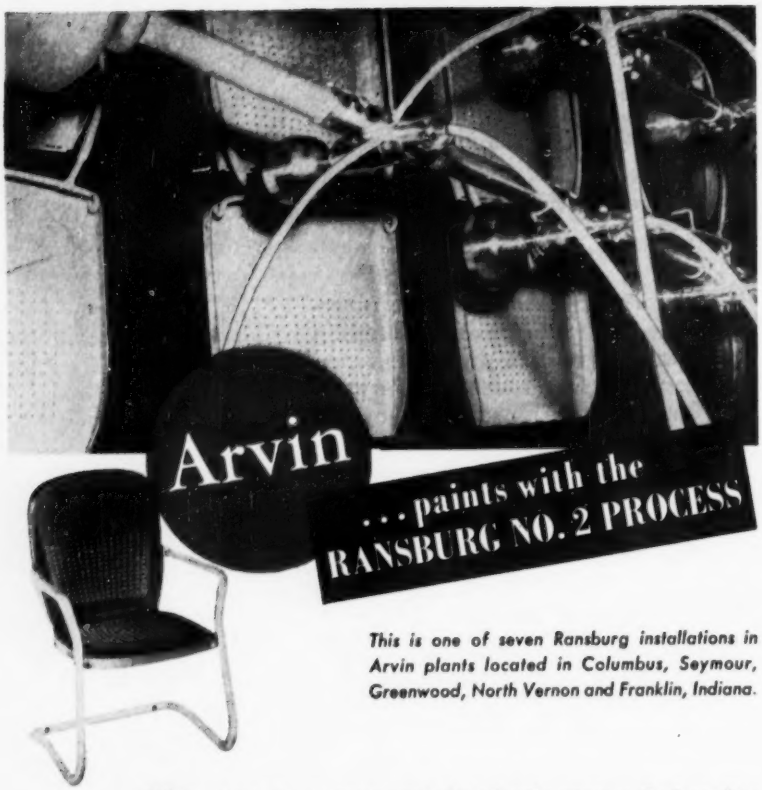
BIJUR

LUBRICATING CORPORATION

Rochelle Park • New Jersey

Pioneers in Automatic Lubrication

261



This is one of seven Ransburg installations in Arvin plants located in Columbus, Seymour, Greenwood, North Vernon and Franklin, Indiana.

When Arvin chair seats and chair backs were redesigned to be perforated with hundreds of little holes in each piece, the former dipping method of coating was unsatisfactory. Here are other reasons why RANSBURG NO. 2 PROCESS was selected to do the finishing job:

1. **Simplicity and rapidity with which colors may be changed without slowing production.**
2. **Less floor space required.**
3. **Provides improved quality with no variance in the required 7/10 mil film thickness.**
4. **Former maintenance and clean-up time reduced to a minimum.**

No savings in paint cost were anticipated. However, the RANSBURG NO. 2 PROCESS—in providing the above, desirable advantages—still enables Arvin to reduce finishing costs 10%. And, that over dip coat!

Want to know more about production efficiency of the NO. 2 PROCESS as it applies to YOUR production? Write for literature showing a variety of typical production installations in factories all over the country.

RANSBURG

Ransburg ELECTRO-COATING CORP.

INDIANAPOLIS 7, INDIANA

wasted (according to Ed), will give us almost four percent of the time that the guy piddles away. Coming to the conclusion that the time wasted amounts to two weeks' vacation for each man in the plant is sort of rubberizing it a little bit. So what! What if it does? Isn't a vacation a means of making a man more efficient? Wouldn't another two weeks make him more efficient? Pass me the pot of java; I'm winding myself into a frustrated knot and need a little annealing myself!

J Homewood
Tujunga, Calif

UNDOUBTEDLY it is a very good thing to have a period of change from the regular working procedure in which the worker can relax. In so doing he can start in again with a vim and carry on more effectively until quitting time.

Unfortunately the relaxing period is utilized by some unjust employees who are eager to snatch at the opportunity for killing time. They do this by dragging out the time allotted to them for their benefit. Under proper supervision the coffee hour can be regulated so as to perform effectively instead of having it become an excuse for horsing around. If one will observe closely he will find that there are some workers who will dilly-dally for many minutes after the starting time in the morning and afternoon and further observation will disclose the same shirkers who take advantage of the coffee hour to spin a few yarns or enter into an argument of some sort.

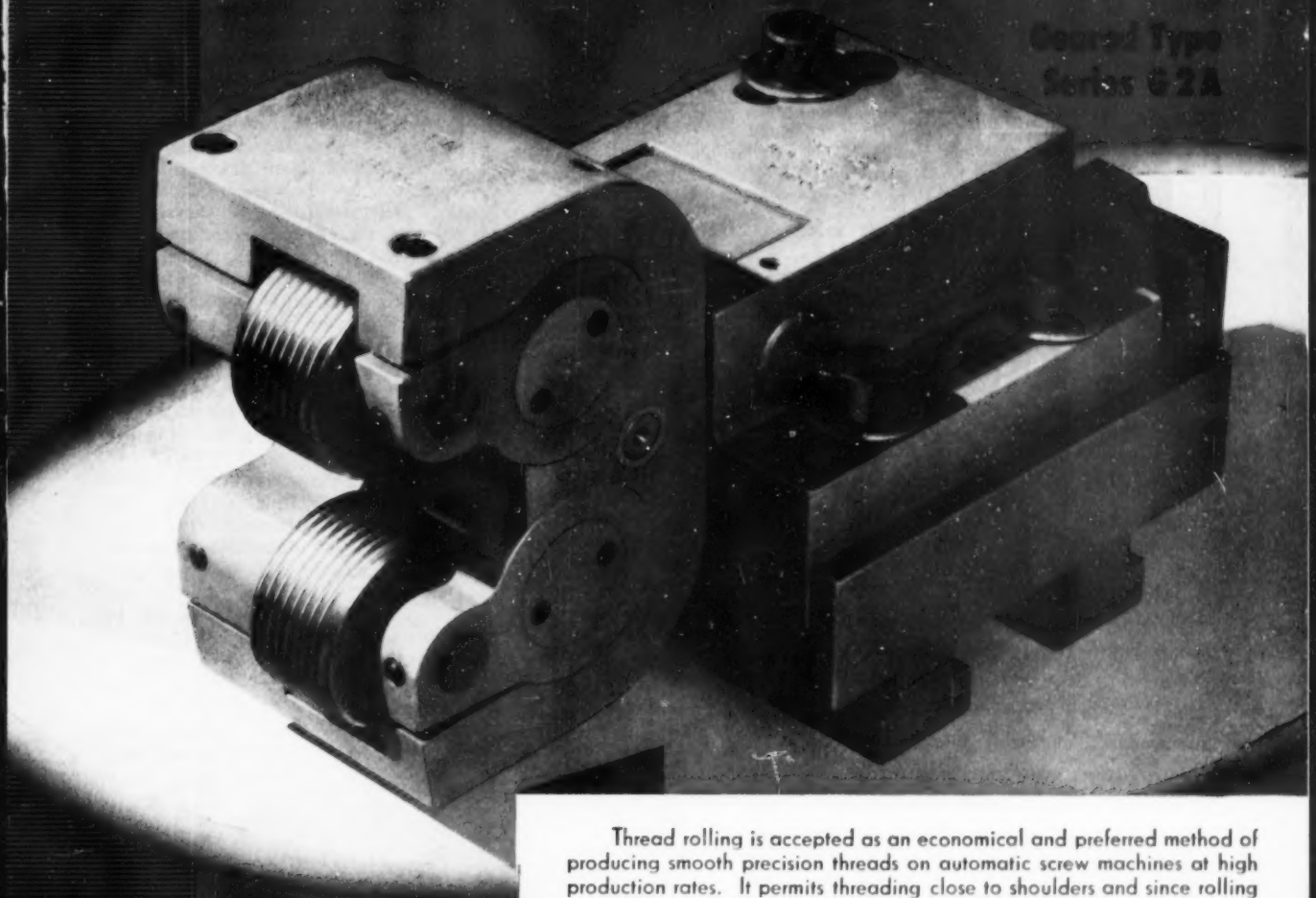
It is a practice among some of the men to enlarge upon their exploits of the day before—be it fishing, buzzing along the freeway, or trying to reach first base. This is particularly noticeable on Monday mornings when the innocent timeclock whiles away the wasted time uncomplainingly. This practice will continue long after they should devote their time to company business.

It is here that the directing power of a good executive is of great value. A supervisor may think he is conscientious on the job by burying himself among his orders through the early hours of the day and during coffee hour, but it would be more to his advantage if he were to do a little observing around; the effect upon the men would tend to eliminate this loitering when they should be on the job. He doesn't need to snap his fingers to get the boys moving; all he needs to do is to

REED Thread Rolling Attachment

FOR AUTOMATIC SCREW MACHINES AND TURRET LATHES

Coarse Type
Series G2A



Full diameter range to maximum capacity

Simple precision matching

Thread rolling is accepted as an economical and preferred method of producing smooth precision threads on automatic screw machines at high production rates. It permits threading close to shoulders and since rolling can be done on the collet end of the part behind shoulders, a secondary threading operation is often eliminated.

The Reed Thread Rolling attachment is a multi-purpose tool with two opposed rolls which pass over the work when rolling the threads. It is built in several sizes and each size has a diameter from zero to maximum capacity. The Reed Attachment is easy to set up. Simple precision matching unit provides for accurate matching of the thread rolls. No change in spindle speeds is necessary and only a few revolutions of the work are required to roll the thread.

Write for Thread Rolling Attachment Bulletin 1-21

REED ROLLED THREAD DIE CO., Worcester, Mass., U. S. A.

EVERY TYPE OF CUT GEAR FOR EVERY INDUSTRIAL PURPOSE

SINCE 1888 . . . We have been making many types and sizes of gears for industry. During these passing years we have derived considerable experience, trained numerous personnel, and expanded our mechanical and plant facilities—and have remained under one continuous management. We are ready to ably serve you.

CONTINUOUS-TOOTH HERRINGBONE GEAR
1" to 60" diameter, 16⅛ DP to 1⅛ DP and up to 20" face.

WORM GEAR
1" to 58" diameter, from 24 DP to 1 DP.

SPUR GEARS
From ¾" to 150" diameter, 32 DP to ¾ DP and up to 30" face.

HELICAL GEARS
From 1" to 72" diameter, 24 DP to 1⅛ DP and up to 20" face.

BEVEL GEARS
(Straight Tooth)
From 1" to 60" diameter, 24 DP to ¾ DP.

SPIRAL BEVEL GEARS
From 1" to 30" diameter, 24 DP to 1⅛ DP.

ESTABLISHED 1888

D. O. James

D. O. JAMES GEAR MANUFACTURING CO.
1140 W. Monroe Street, Chicago 7, Ill.

make his presence known and his displeasure noticeable. I would advise that he post a notice, or, what is better, assemble his men and talk straight from the shoulder and make it plain that work starts with the clock and not when an individual feels so inclined.

If for no other reason than the psychological effect, he should be on hand to see that work starts when it should and unhesitatingly inform those who like to piddle away valuable company time that "recess" was over. If the practice continued he could threaten them with the elimination of the coffee hour and then, if they don't toe the line, back up his warning with action.

There is a certain type of worker —or should I have used the term, shirker—who strives his utmost to get away with anything and privileges he has been granted in the past few decades seem to encourage his propensity toward dishonesty. It is this time-killing individual who makes it difficult for the fair-minded worker who appreciates these privileges and does his utmost to show it by doing his very best. The large majority of workers are fair-minded and have a desire to do their best in effort but why contaminate this class by exposing them to those who tend to tear down the structure of honest work?

The foreman who takes this coffee-hour-time-stretching on the chin without making some effort to eliminate it is doing himself, his employer, or the conscientious men irreparable harm. The fair-minded worker should express his individuality by ignoring the efforts of the shirker to intimidate him and the guilty ones should have cans tied to their shiny trousers and kicked downstairs.

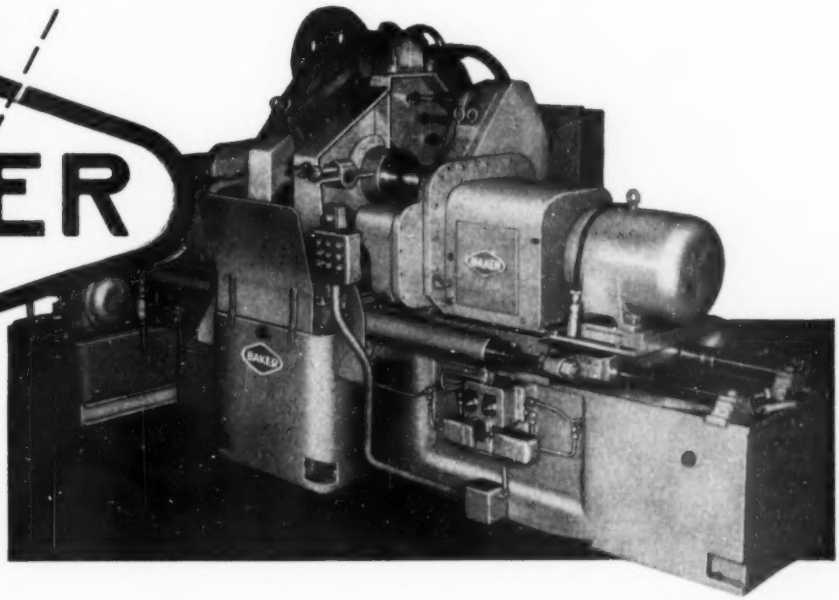
Dinney Yutz
Hollywood, Calif

"Did anyone in here notice the decimal point in the motor rating I ordered?"

Modern Machine Tools..

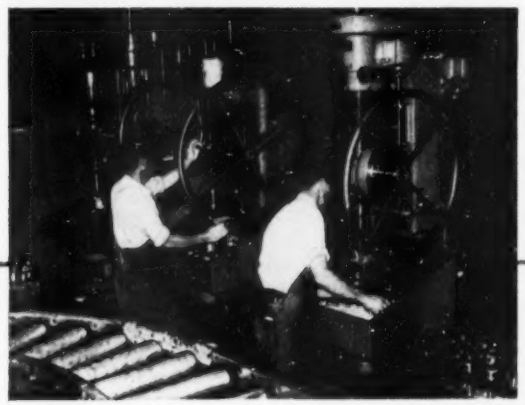
SLASH PRODUCTION COSTS!

New BAKER Method



1 Operator . . .
1 Machine . . .

Multi-Operations Fully Automatic On 4 Parts Simultaneously—Load—Drill—Core Drill—Ream—Unload



THE OLD METHOD —

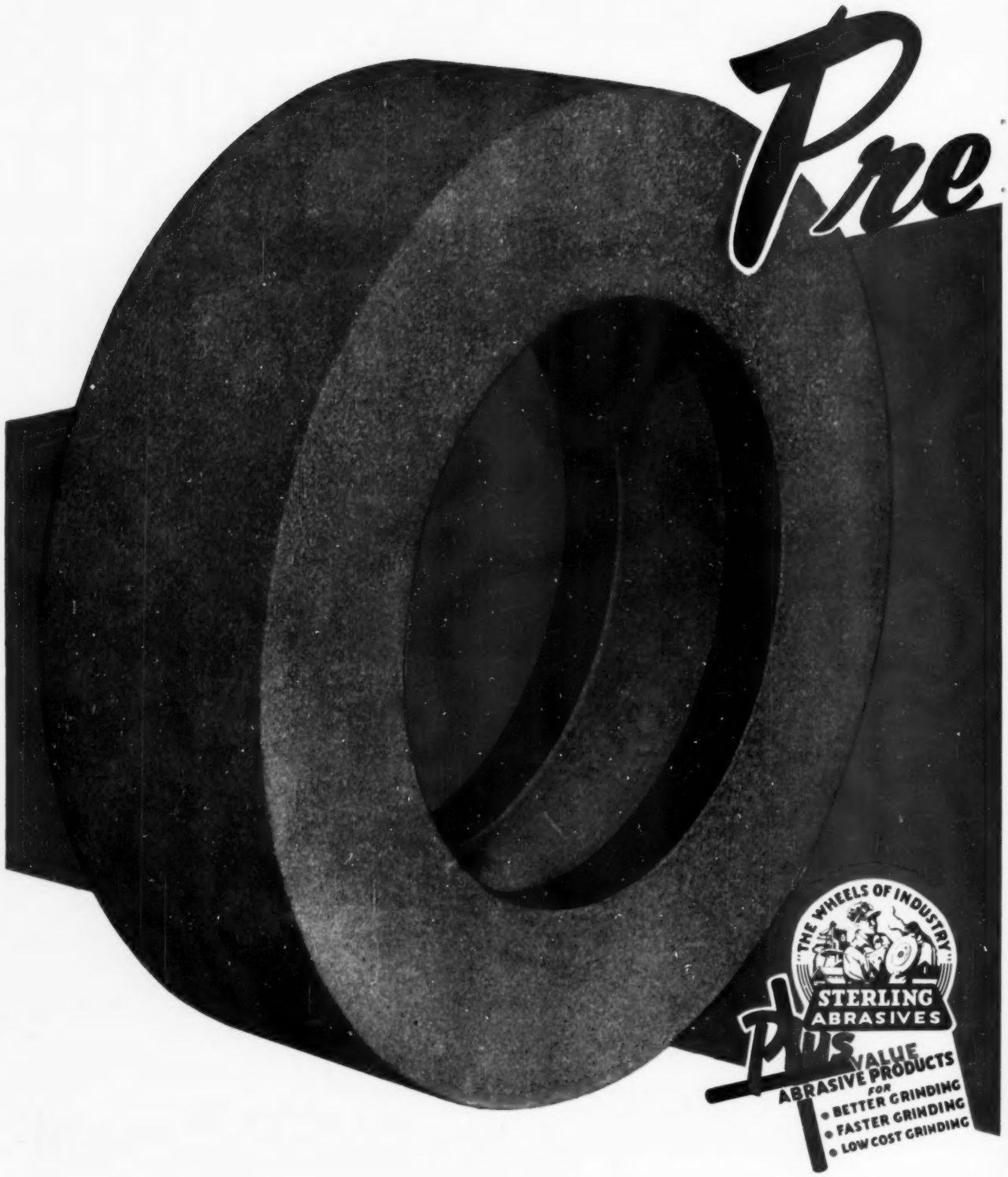
2 OPERATORS . . 4 MACHINES . .

Hand Controls + Excessive Handling + Capstan And Hand Engagement Of Feed + Operator Fatigue = Low Production Rate At High Cost.

INCREASE PRODUCTIVITY..
with a NEW BAKER 'Special'

WRITE REGARDING YOUR SPECIFIC JOB PROBLEMS...

BAKER BROTHERS, INC. Toledo, Ohio
DRILLING...TAPPING...KEYSEATING and CONTOUR GRINDING MACHINES



THE STERLING ABRASIVES

OF THE CLEVELAND

BRANCHES . CHICAGO – CLEVELAND – DETROIT

-Tested . . . .

By Constant Study on Thousands of Successful Centerless Jobs Plus Individual Concern For Your Particular Grinding Problems.

Sterling's Centerless Grinding Wheels have behind their years of successful operation the combined experience of our engineers on previous jobs. In addition, you have the proven abilities of Sterling laboratory technicians and abrasive engineers on your particular setup. All these important factors enter into the selection of the correct wheel specification that does your centerless job better, faster, more economically!

What is your grinding problem . . . elliptical parts, plunge cuts, magazine feed, slight tapers, thread grinding or a special setup? Do you need faster, more accurate production now? If so, Sterling's "Wheels of Industry" can provide everything you need for more efficient results on any troublesome job.

There need be no guess work about it! Results prove our promise of better grinding everytime. Specification duplication, ordinarily so difficult to obtain, is a fact when Sterling Centerless Grinding Wheels are used. That's where Sterling's Research and Development Program pays off!

Sterling engineers, skilled in all phases of centerless operation, are ready to prove how much greater production you can enjoy once these superior wheels are on your jobs. How about a test in your plant sometime this week? No obligation. A phone call or letter will bring a Sterling grinding expert in a hurry.

Send for these Folders.

As a supplement to the services of a Sterling engineer, these folders will prove a handy reference file for your daily use in determining the correct wheel to use for any grinding operation. Send for yours today!

DIVISION · · TIFFIN, OHIO

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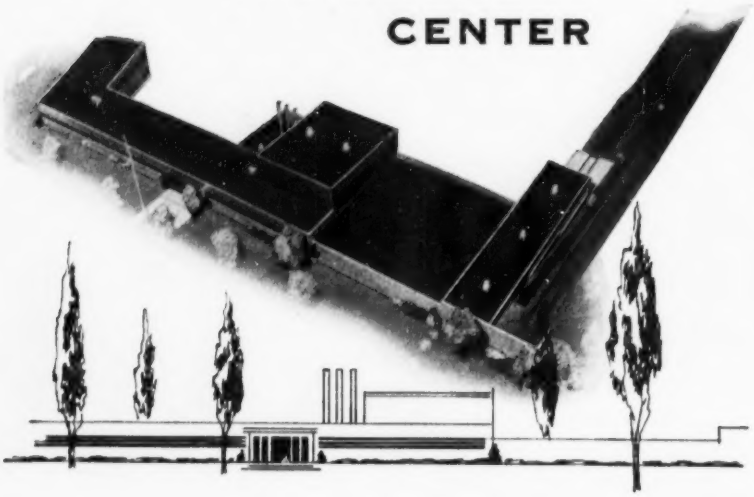
NATIONAL
TECHNICAL
CENTER



Building for your future...

Newest physical testing machinery . . . latest electronic test devices . . . a new building designed for their efficient use . . . railroad car impact test tracks—that's the *new* National Technical Center where continued tests and research on castings and devices will be carried out.

The Technical Center's facilities are available to you manufacturers and railroaders who seek new facts and data on the strength of castings used in your products.

NATIONAL
MALLEABLE AND STEEL
CASTINGS
COMPANY
Cleveland 6, Ohio

85TH ANNIVERSARY
M&S C
1868 ... 1953

As presented by Al and Ed, there is much to be thought out before any course of action is to be put into motion.

For many years back there has been a great deal of consideration among those in plants in authority given to the subject of periods of relaxation and refreshment between starting time and the noon lunch time, and we find that the accent seems to be for them rather than against.

Ed, as is usual, is opposed to such a period of diminution of the usual efforts of the employees, because he is for anything which is not giving the employees a reasonable deal.

Back during the days when we worked from 7 am to 12, it was quite the custom for a man to open up his lunch kit about 10 am, pour out a part of the coffee which he had brought from home, and he might also eat a sandwich while he was taking a long cut on a lathe, or, if he were working in the boiler-room, grab a bite between boiler firings. In a large power house, the water tender could be seen most any time munching on some kind of fruit as he passed from boiler to boiler, and so it went in those days.

Ed mentions that employees will take advantage of the short relaxation period. This may be so on the parts of some of the employees, but the usual thorough-going American appreciates the many privileges which now prevail and offers a day's work for a day's pay.

A good many years ago there was a laugh on a foreman in a large shop, and, as it has been traveling around for so long a time, it may have reached many ears, but it won't hurt anybody if it is told here.

Bear in mind that it was the custom in those times for a shop man to provide all of his tools to do his work. (This did not include sledges or similar things.) A machinist of Dutch importation and descent was

TAP PRODUCTION IS HY-PRO'S SPECIALTY!

...let it save dollars in your operation

Hy-Pro's business is tap production. We concentrate our operation—design, production, service—on the constant perfection of this important line. Because of it, Hy-Pro has built and maintained its position in industry as the "tap specialists."

Our engineers are always on call to help with any tapping problem. Whether you have a question about a special need, or about part of your regular operation, it will pay to contact Hy-Pro.

Call or write us or your nearest Hy-Pro jobber today. We offer you a complete line of top quality taps, produced by specialized engineering.

REG. U.S. PAT. OFF.

HY-PRO

HY-PRO TOOL CO., NEW BEDFORD, MASS., U. S. A.

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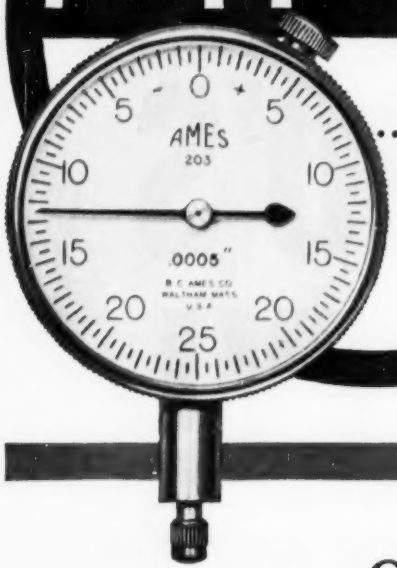
AMES



...the preferred Dial Indicators

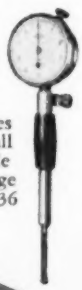
One of America's largest and most famous mass-producers recently chose Ames as preferred source of supply for indicator gauges.

The reasons behind this decision are the very reasons why *you* should standardize on Ames dial indicators and dial gauges:—the Ames "Hundred Series" indicators available in four sizes, fit every measuring requirement; they are *accurate, sensitive,* low in friction, yet are *rugged* and *tough*—give *more* on-the-job time. All Ames products embody latest design and highest-quality materials; they are manufactured by methods and machines that are *exclusive* with B. C. Ames Co.

Ames Dial Depth Gauge No. 11C

Ames Dial Micrometer No. 517

Ames Amplifying Dial Comparator No. 26



Ames Small Hole Gauge No. 36

Send today for your free copy of Catalog No. 58

Representatives in principal cities. B. C. AMES CO. *26 Ames Street Waltham 54, Mass.*

Mfgr. of Micrometer Dial Gauges • Micrometer Dial Indicators

to come to work on a Monday morning at 7 am. Much to the surprise of the foreman, the man appeared without any tools and the foreman asked him why he hadn't any with him when he came to work.

"I'll have to go back and get them," the Dutchman replied.

"Why didn't you bring your tools in the first place?" yelled the foreman, who was somewhat of a bully.

"That's where I left them," replied the new man.

"Where?"

"In the first place," and the Dutchman left and never returned.

As for taking a nip of booze before starting work, few companies allow any of their employees to bring such into their plants, but, in a few of the States, there are refreshment bars in plants, where beer is sold at cost (to the company) but, in most cases, the bar is not open until the noon period.

On a slightly different front, there are many plants in which snack carts are being moved at practically all times during working hours. From these carts an employee simply takes what he wishes as the cart is stopped for a short interval at his place of work. In at least one case, if the employee hasn't any money with him, he can sign a ticket and the sum of these tickets is deducted from his pay envelope. These tickets are placed therein so that when he gets his pay, the cash and the amount of the tickets make up the full amount which he has coming.

There was a period when many firms looked upon all employees more or less as chattel.

That kind of stuff doesn't go today for the brass has become more human and the employees are better educated, live better, have brighter homes, and all of this makes for a

"Mr Hedwick is on vacation—can I help you?"

Don't *tell* him,
Mr. Anderson . . . . . *show* him!

That new man in the shop, Mr. Anderson, will ask a lot of questions about taps and tapping results. But we know, and you know, that *showing* not *telling*, is the proof of "*performance-ability.*" Show him what Hanson-Whitney taps are doing . . . point out their complete dependability in day-in, day-out production. Then, like you, he'll be sold on . . .

Hanson-Whitney.....

The Hanson Process is the original method of *finishing after hardening*. Through this process, Hanson-Whitney has for 34 years produced a quality line of finished precision taps to the complete satisfaction of our customers. We have *never* manufactured cut thread or unfinished taps in our years of serving the metalworking industry.

Yes, Mr. Anderson, the proven performance of Hanson-Whitney taps is a matter of record. Naturally, the right tap for the specific job is essential . . . ask the Hanson-Whitney representative for recommendations.

HANSON-WHITNEY DIVISION of the WHITNEY CHAIN CO.
160 Bartholomew Avenue, Hartford, Connecticut, U. S. A.

the **HANSON**
Threading Processes
Offer Complete
Coordinated
Responsibility
for
The Machine Tools
The Cutting Tools
The Measuring Gages

* Our "Mr. Anderson" is a composite character typical of the thousands of experienced practical machinists throughout the country. You, too, have a Mr. Anderson in your shop. ask him what he thinks about Hanson-Whitney products.

8HW53A

Never Before

SO MANY ADVANTAGES for HIGHEST PRODUCTION

4800 PER HOUR!
3800 PER HOUR!
2500 PER HOUR!

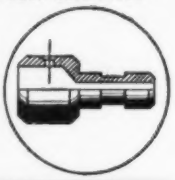
SNOW

FULL UNIVERSAL MACHINES

Air operated, electrically controlled Snow tools are establishing amazing production records daily on a wide variety of work. Just note these typical examples:

DRILLING

Crossdrill and C"T" Slot 1/16" Hole
Material—Brass
Production—4800 per hour
Fixture—#15 Vertical index
Equipment—#1-UD Drilling Machine

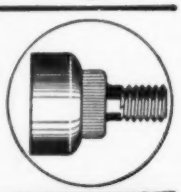


TAPPING

Tap Two #10-32 Holes
Material—Steel stamping
Production—3800 tapped holes per hour
Fixture—#14 horizontal index
Equipment—#1-UT tapping machine

THREADING

3/8"—24 Thread—1/2" Long
Material—Die Cast Aluminum
Production—2500 per hour
Fixture—#10 Drum dial
Equipment—#3-TR Threading machine



Snow air operated—electrically controlled machines have built in full universal controls that allow selection of the type of spindle cycle desired. This feature also permits instant synchronization of the standard Snow Master Fixtures. All types of air operated automatic and semi-automatic jigs and fixtures are carried in stock. Standardization permits low cost tooling—and—high production.

Sensitivity of power application prevents tool breakage.

Simplicity of control means that set up and operation can be handled by a less experienced operator with minimum fatigue.

Submit Sample Parts f

SNOW

MANUFACTURING COMPANY
435 Eastern Ave., Bellwood, Illinois
(Chicago Suburb)

Single Spindle Verticals • Two-Spindle Verticals • Two-Spindle Horizontals • Automatic Nut Tapping Machines • Drill Press Tap Heads • Automatic & Semi-Automatic Jigs & Fixtures

more contented population and more optimistic levels in life.

Some time ago, the story goes, a truck driver was in the barber's chair when his boss came along and hollered, "You've got no business having your hair cut on the company's time."

"Well, it grew on company time, didn't it?" And that ended the bit of vaudeville right there.

And so we say that there is more fellowship in a whole organization today than could be found in any plant forty years ago, and each man is unto himself, an individual. In the make-up of any organization, a few will soak up all of the time they can doing nothing constructive, but the men who like to be men to one another will be the first ones to get the real promotions, and if not promotions, favors in the way of higher pay.

Such men are the back-bone of our good old USA, and may the day never come when it will be different.

F H Stebbins
Worcester, NY

IT IS A PITY that all privileges evidently must be abused. I suppose this is due to lack of economic education, or lack of loyalty. I'm afraid the latter is increasing to the detriment of high production. If the coffee break is thought of as a remedy against low production, I don't think it is enough, although it might be a stimulant. An incentive plan of some sort is more effective.

When workers don't do a full day's work every day there must be some deterring factor present, the conditions of their minds probably being the greatest one. All men's activities, as everyone knows, are regulated by their brains. What is it then in their brains that holds people back from doing their best? Of course, there may be many reasons, but not including illness, accident, domestic troubles and the like, dissatisfaction with something is often at the root of their lack of action. Some of these dissatisfactions the employer can perhaps avoid if he knows what they are and why they exist. Others he cannot dispel because that might jeopardize his own existence, etc.

Sometimes cooperation with the union may enforce discipline in many situations. I think the coffee break is one of the privileges any union leader is eager to prevent being abused, because he knows that if taken advantage of it might be discontinued.

I recommend to Ed and Al to talk the thing over with the shop steward, and if this doesn't stop the guys from abusing the privilege, they should

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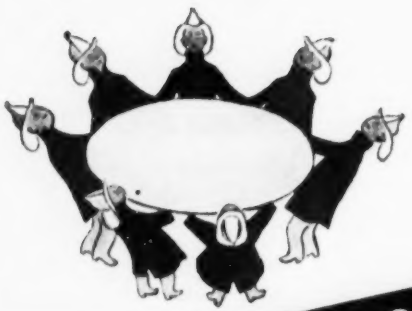

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hint that they must report the unsatisfactory condition to management, and if this doesn't help, the management would have to consider what action to take. No employer need tolerate any kind of abuse. If the boys don't appreciate a privilege enough to prevent taking advantage of it, they are not worth having it.

If the crew in any shop is given a short period for relaxation and coffee break, why not keep everybody at their places of work and serve the coffee in paper cups right there from a bar-wagon? Naturally, a nice girl should do the serving. It is not necessary that all men drink their coffee at the same time, so no specific hour should be fixed for the purpose, nor do I think it is necessary to give ten minutes. At places where people do piecework not more than five minutes would be used.

It is very sound, as Al says, not to get penny-wise and pound-foolish just because a few fellows take advantage of something. If this is the case Al might talk sense into these few, which he perhaps would have to do now and then, as people of that kind often fall back into their habits.

Although most men would compensate for the privileges they are getting by working with more interest, I don't approve of such concessions being stretched so far as to render law and order unnecessary.

A E Fristedt
Stockholm-Bromma, Sweden

HAVING WORKED IN several shops where it was customary to take time out in the middle of the morning for coffee or its equivalent, I don't think there is as much of a problem involved as our friend Ed seems to think. I do know that the workers in the shop did appreciate the privilege of the mid-morning break and looked forward to it; some were of the type who did not feel like a big breakfast before coming to work in the morning and this time-out was just what the doctor ordered. As far

Shown here is a comparator with balanced dial and tolerance hands mounted on one of two vertical supports available.

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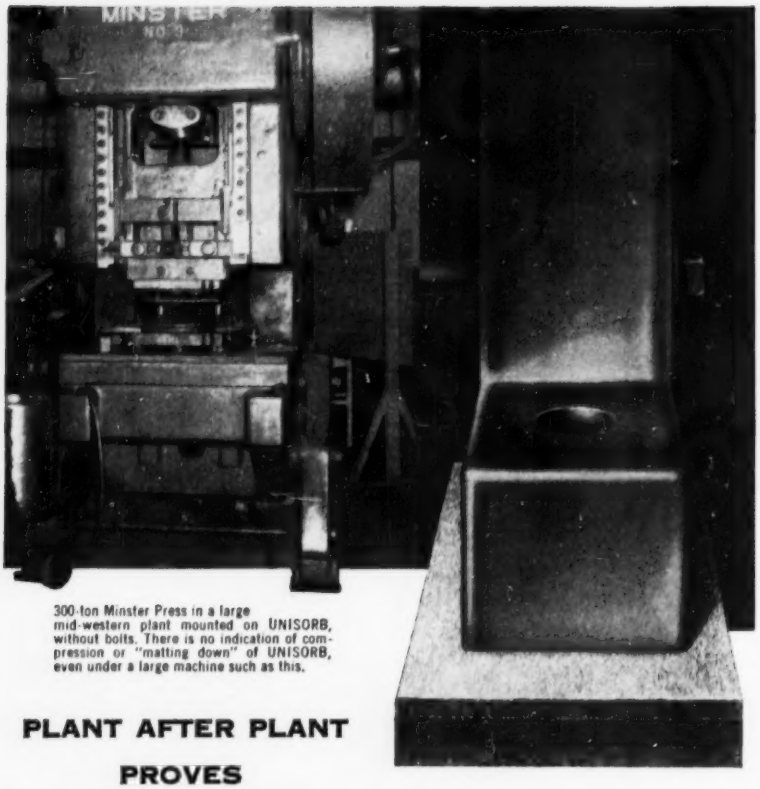

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as I could see, none of the boys attempted to drag it out, and I am sure if they had, a word from the boss would have kept them in line—that is if none of the oldtimers didn't beat him to it. They appreciated the coffee period and didn't want it abused and taken from them.

I think if Ed is of the opinion that some of the boys are taking advantage of the time-out period, the obvious thing to do is to get after the offenders in the same manner he would treat any other infraction of the shop rules. Of course, it may be that Ed is of the oldtime bulldog breed that resents any coddling of the men in the shop and fumes inwardly at an attempt to make life a little pleasanter for the man at the bench or machine.

I can remember one old codger of this type who frowned on what he called new-fangled ideas of scientific management. One of his pet hates was any attempt to sit down at even the most back-breaking job in the shop; stools were taboo—except in his office. His word was law until a change in top management came along with more liberal ideas. Someone in the front office got the idea that it might reduce operator fatigue and increase production if posture chairs were used wherever unnecessary standing was involved, so a memorandum to that effect was circulated throughout the plant and finally reached the old boy. In the memo each foreman was asked to state how many posture chairs would be required. His reply was blunt and brief, "None—no women employed here." However, in due course six of these posture chairs were delivered to his shop all wrapped up in protective paper covering. But they stayed wrapped behind his office in dead storage.

Maybe Ed isn't precisely that type

"I think everyone knows you went to Mexico on your vacation—now get on the ball and turn out a little work around here!"

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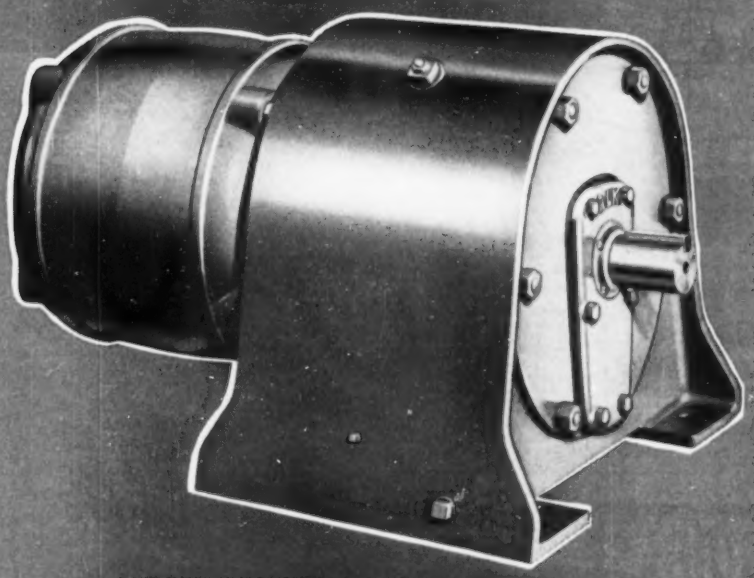

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In order to meet the greatest number of industrial application needs, the newly designed Integral Motoreducers are available in horizontal and vertical models, both in concentric and right-angle types; double, triple and quadruple reduction; horsepower range, 1 to 40 HP. Prompt stock shipment in standard ratios is offered.

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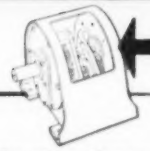

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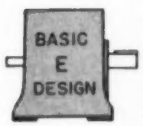

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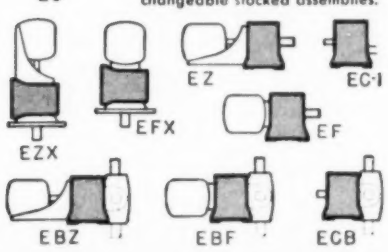

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of die-hard, but just a little too concerned about the lost time involved. Frankly, I am not of the opinion that a coffee break will increase production, but I do know that production was maintained and a certain amount of good-will generated in the shops I mentioned where this mid-morning halt was the rule. In British shops they tell me, a mid-morning and afternoon break has been the rule for a number of years. I don't believe they can top us when it comes to production, but they turn out some mighty fine airplanes and motor cars, as well as competent craftsmen. So their time out for tea cannot have too deleterious an effect.

Generalization can be harmful in some instances and the statement that the average worker if given an inch will take a mile belongs in the harmful category.

Robert S Alexander
Greenville, RI

IN THE SO-CALLED "good old days" workers developed unique ways and means of stealing a smoke or a bite to eat on company time whenever they thought that the boss wasn't looking. However, the boss usually was looking, but he turned his back upon the incident because there was nothing to do except to scold or criticize. There were no established precedents for coffee or smoke breaks —such liberties taken at company expense were considered akin to stealing money from the boss's pocket.

With the tremendous increase in industrial development brought about by two great wars, and the employment of large masses of people working long hours, there was a noticeable decrease in production due to fatigue.

Study and experiment proved that a relief period between breakfast and lunch time increased production efficiency — further investigation showed that this increased efficiency was advanced when workers were supplied coffee or other refreshments in limited quantities. Management noted these results and went all out in favor of the coffee break—but as in most everything else, there is the law of diminishing returns—management tried to arrive at a happy medium of time to be allotted and the kind and quantity of refreshments to be made available to maintain peak efficiency. It was noted that too much time or too heavy eating had a negative effect by causing the worker to relax into a state of sluggishness which would show up in decreased production.

If the allotted time, usually ten

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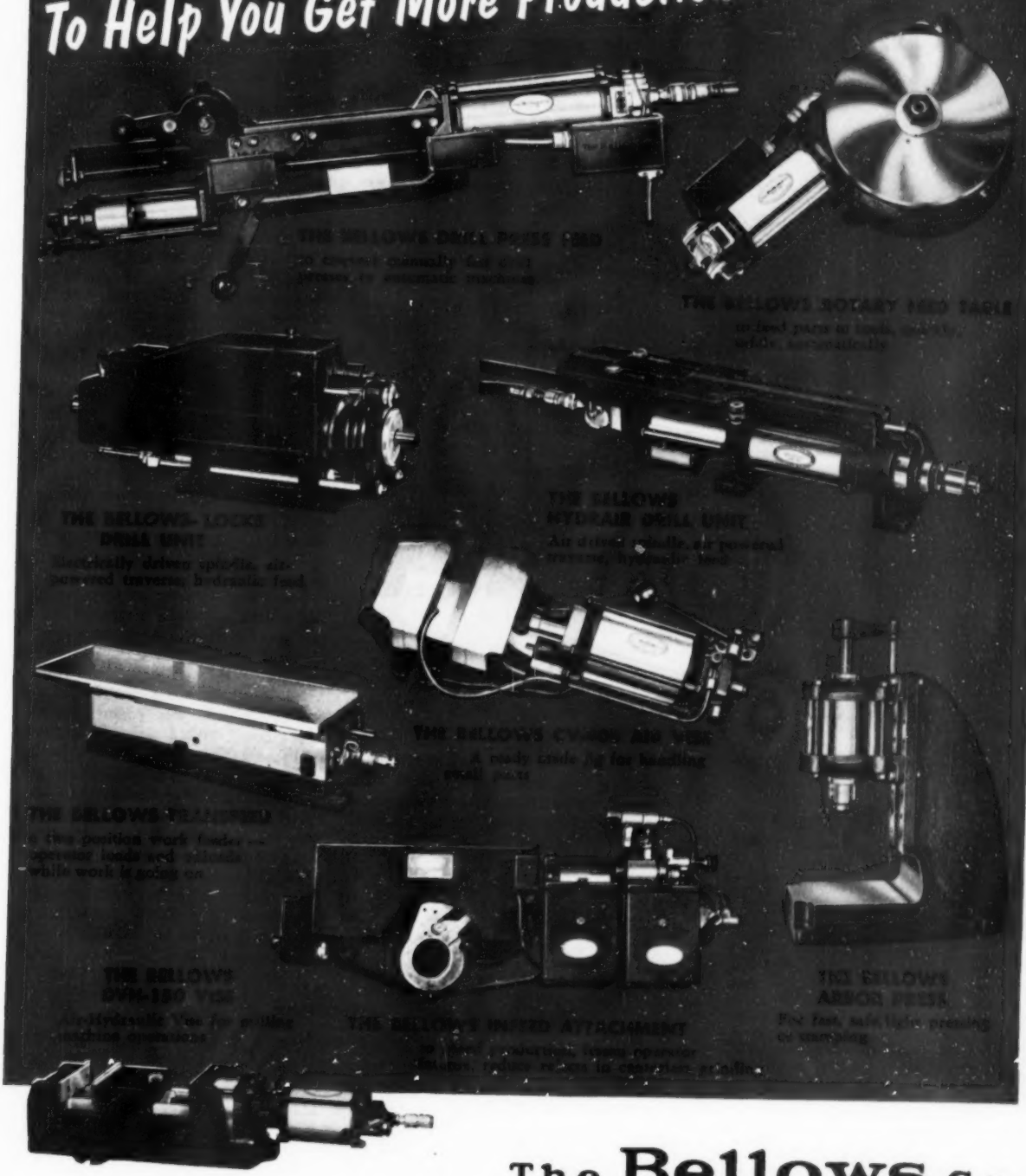

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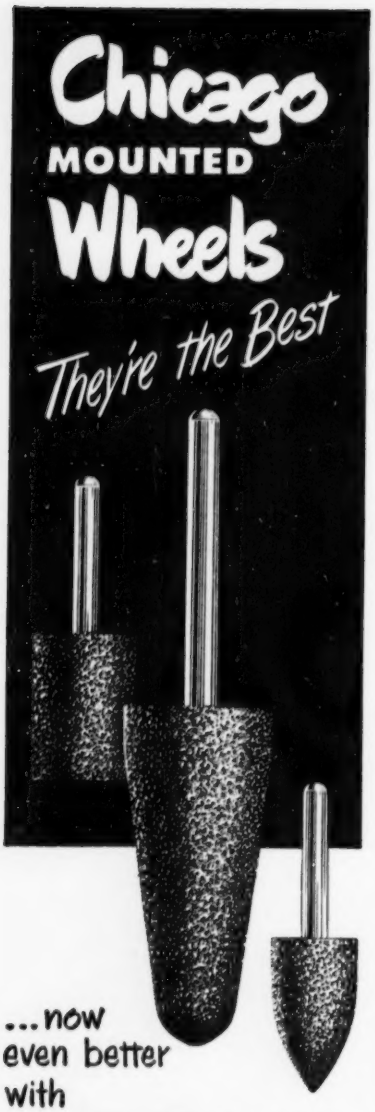

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minutes, was adhered to, and only small amounts of food were available, the tension and alertness developed by the worker before the rest period was not relaxed enough to cause the worker to want to go to sleep or to get lazy.

However, as in so many other matters, such as safety programs, etc, after management goes all out to establish high efficiency in control and operation—there is a sudden relaxation and the program is left to flounder on its own—people become careless and the over-all efficiency drops to a low ebb—and in the case of the coffee break, the workers follow the lead of foremen and supervisors who take advantage of laxity.

The coffee-break program, like the safety program, is a good thing, but it must be competently controlled. This responsibility lies with management and supervision. The control and guidance of workers is a day-to-day proposition, and if a coffee break program is to do the job for which it was designed, it is up to management to see that the program is properly administered or forget it and let the workers go back to stealing time out when they think the boss is not looking.

Henry George
Kettering, Ohio

•

TOOLROOM OR SCHOOLROOM?

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Is it risky to put a new man on a tough job, even though he is supposedly qualified by experience in other shops? Does "learning by doing" justify a waste of time and materials?

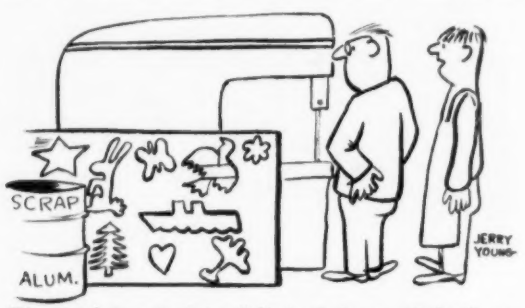
ED IS NOT USING good judgment in putting a comparatively new man on a complex and very expensive die. Ed's prime job, the job he is hired to do, is to produce accurate tools and dies at a profit. It is not enough to be able to operate a department to produce first class work; many neat workmen can produce accurate tools and dies if given lots of time, but when cost is totaled, the company has lost money. It is the fast-working, accurate toolmaker who really helps the company to stay in business, and it is men of that type that the efficient foreman is constantly striving to gather together in his department and keep them there.

A new man, no matter how well recommended, is always an unknown quantity and it is not wise to start him off on expensive and complicated work—in fact it is not fair to him. The new man is among strangers and strange machines and he has to get to know both well before he can get over his nervousness, which may be subconscious. As soon as he gets to know the fellows in his department and the feel and peculiarities of the machines he uses, then he will regain full confidence in himself and start turning out the best work he is capable of producing. Then, and not until then, can the foreman grade the man and avoid giving him jobs beyond his capacity to accomplish at a profit for the company.

As the man gets more familiar with the materials, tolerances, and finish requirements of his new job, he can be given more complicated and closer tolerance work; thus the capable foreman will work the man up to the limit of his capacity and accuracy with the minimum of risk to the production costs of his own department.

The foreman who delights in giving a new man the toughest job in the shop with the hope of showing him up has no place in a modern shop. A good foreman always tries to make a new man feel that he is among friends who will help him make good; then if the man actually is incompetent and has to be derated or let go, he as well as the rest of the gang knows that he has been given a fair and impartial test and has been unable to prove himself competent for the work he claimed he could accomplish.

Of course even the most expert of toolmakers are liable to make an error and, unless this is due to plain carelessness, the foreman should



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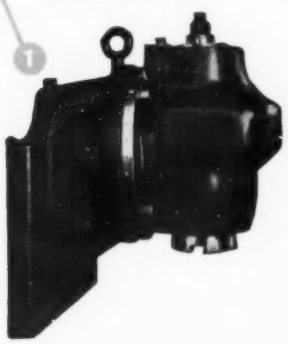

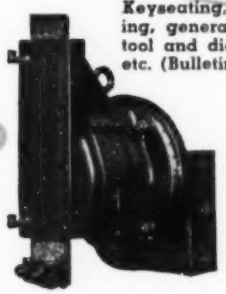

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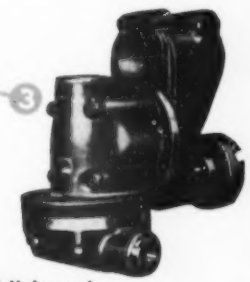

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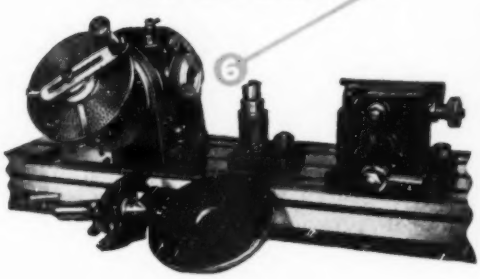

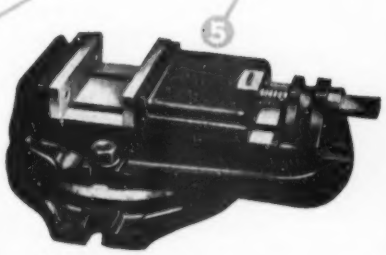

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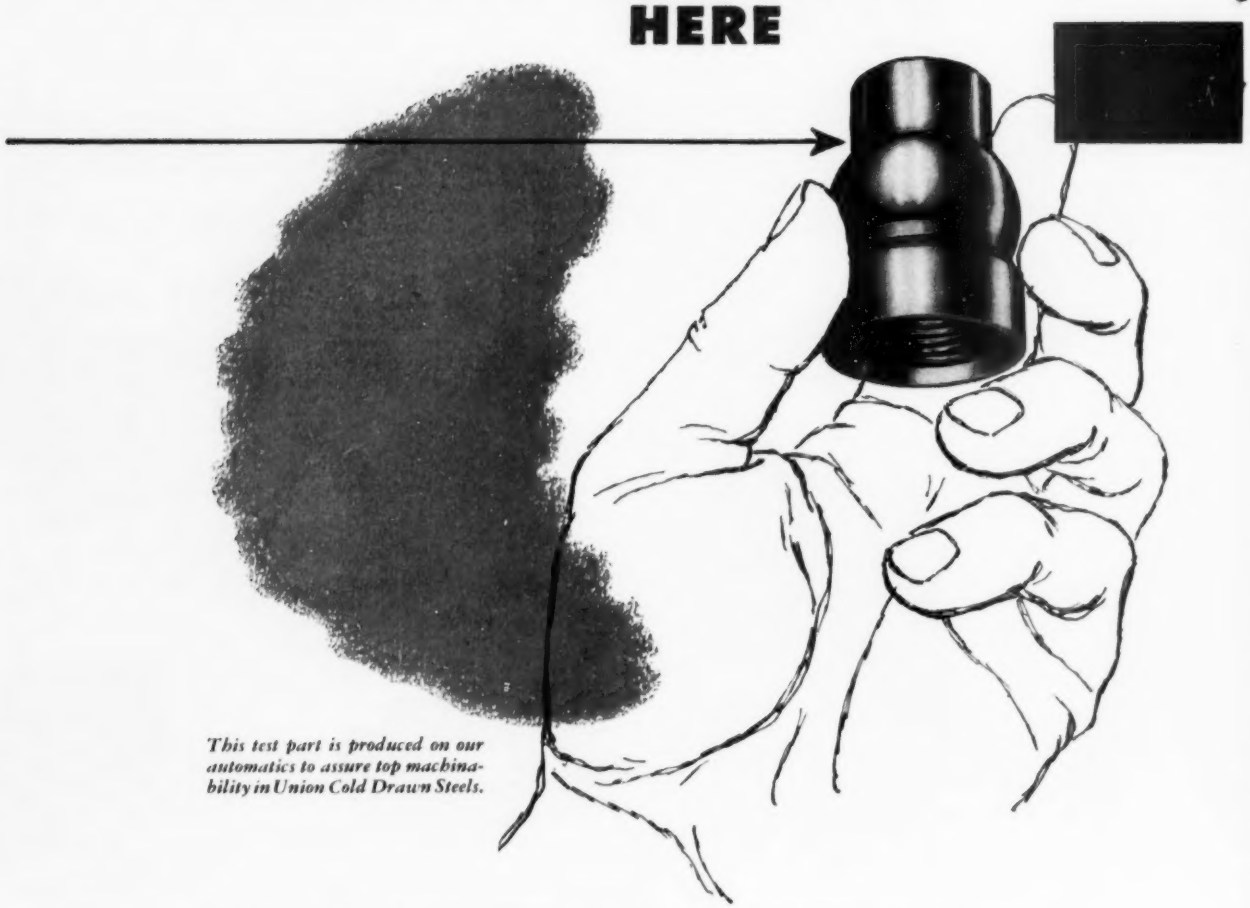

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Used for chip breaker grinding, surface grinding, large cutter grinding, cylindrical grinding. In sizes from 2" to 14" in diameter.

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Type D6WHC:
Off-hand grinding, single point tools. Rough grinding inserted blades. In sizes 3½, 6, 10, 14-inch.

Type D11T:
Universally used for tool and cutter grinding. In sizes 3, 3¼, and 5-inch diameters.

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For honing the edges of cutting tools in position on machines . . . to prolong cutting life between re-grindings.

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Internal grinding, and contour grinding in carbide dies.

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AURORA, ILLINOIS
MADE IN AMERICA FOR AMERICAN INDUSTRY

help the man to correct the mistake at a minimum loss to the company and refrain from referring to it again. Of course if repeat errors keep occurring, the usefulness of the man to the firm is in serious question.

A good foreman always has at least two men in his department who can tackle any job that the company contracts for and which could be scheduled to his department. At the same time he is training his other men for better work.

No matter how good a gang the competent foreman has, he is constantly training and helping the less experienced ones, for he wants only top-grade toolmakers in his department, since a modern tool and die department turns out only one grade of work—the very best, and the foreman knows he cannot have too many good, competent, fast workmen.

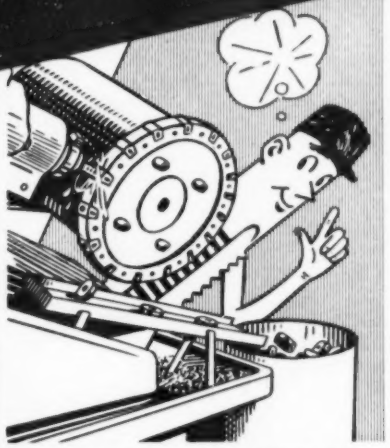
George P Pearce
Albuquerque, NM

EVERY FOREMAN, at one time or another, is faced with problems and Ed seems to be no exception. He too, like all foremen has also to listen to self-appointed critics who would tell him to run his department by the book. Someone will tell him what happened to so-and-so when he gave some poor devil a chance to show his mettle and he failed to come through. But the fact remains that any foreman who wishes to build a sound organization cannot afford to listen to these prophets of doom. He certainly cannot afford to save all his tough jobs for a select few and leave the run-of-the-mill items for the rest of the shop force. Because sooner or later one of two things will happen; the select few will dwindle, or the tough jobs will get more frequent. Either way, Mr Too-Conservative is going to be left holding the bag.

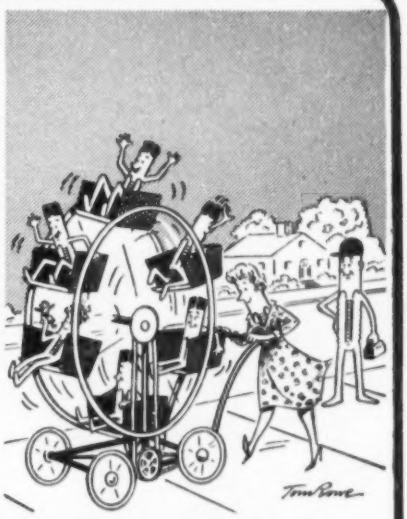
So it would seem to me that Ed,

"I want to turn this drill in. It seems to be over-heating."

TAP-ODDITIES



Round and round the rotary goes
At mass production speed.
Pete sez: "For real economy—
Bath Taps are what you need!"



This go-cart — on the rotary plan,
Solved Pete's production woes.
His "wheel of fortune", spins around —
And where she stops — nobody knows!

In these days of long runs, "production tapping" is an art. Considerable study must go into the cycle and handling time.

1. The cycle is the time necessary to complete a full tapping stroke and is dependent on the spindle speed and the pitch of the thread. The only productive time, is while the tap is actually cutting the thread — therefore, the reversing speed is usually increased to a 2 to 1 ratio.

2. Handling time varies with the operator — or with mechanical factors, if the feed and discharge is automatic. Some threading jobs have a long handling time and a short cycle, while others may be just the opposite.

Study of the style of tap used is important — and Bath engineers are often able to make a slight change in a stock tap to give better operating efficiency and step up the tapping cycle.

Let a Bath representative check your production tapping set-up. He'll help you get Better Threads with Bath Taps.

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in spite of Al's dire predictions, is doing the right thing by giving his less experienced men a chance to break in on the tough jobs. To be sure it may mean a little more supervision, but in the long run it will be worth the effort and the company will gain by it. Last, but by no means least, the men will have gained confidence in their own ability and will tackle any job that comes along. When you build an organization like that you bet the company's money and material on a sure thing.

Robert S Alexander
Greenville, RI

A QUALIFIED DIEMAKER should be able to do the tough jobs as well as the less complicated dies. It is not fair to give one man all the tough jobs; if both men are getting diemakers' wages I don't see why we should baby one and overwork the other.

Make sure the employee knows all there is to know about the job he is assigned to, then let him go ahead and do it. Every boss has to take a chance at some time. The only way we can find out if the omployee can do the tough jobs is to assign him to one. That's what makes skilled mechanics. If we don't encourage and show confidence in the employee, we find ourselves in trouble when the complicated jobs come along in quantity.

No one of us would ever learn anything worth knowing if we did not pitch in and try. Most tool and diemakers like the complicated jobs and take pride in their work. A man is more enthusiastic about what he is doing if he knows his part is important. Most craftsmen want to feel responsible for the job they are doing. They don't want someone looking over their shoulder all the time. They want that feeling of pride, importance, and ownership in the job they are doing.

A E Salmons
Philadelphia, Pa

PERHAPS IT IS NOT a question of how much time and material a company can afford to bet on a man, but rather how can the foreman be sure that the man is capable of learning and doing a good job.

Some people can go through life without being able to actually accomplish well anything they attempt. They have the knowledge but somehow lack the ability to put that knowledge to work properly and efficiently. It is the lack of coordination. It is not always easy to determine this factor in an individual. It requires skill of analyzing people and their work ability. Practice

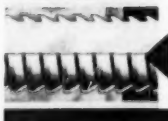
Drill jigs and other fixtures are simpler, cheaper, smaller when made for use in a SPEED VISE. Instead of a cumbersome and expensive box jig, with a SPEED VISE it is only necessary to make a simple jaw plate to fit the part being machined and hold drill bushings, etc.

QUICK ACTION DESIGN The fastest acting vise you've ever seen. One hand operation—lift . . . slide . . . lock . . . that's all there is to it.

STANDARDIZED HOLES for attaching jigs or jaw plates are provided in the jaws of all SPEED VISES.

HARDENED STEEL is used on the screw and locking nut to provide minimum wear and extra long life.

HEAVY SEMI-STEEL CASTINGS for extra strength and a heavy base plate for rigidity are part of the SPEED VISE construction.



PATENTED THREAD FORM of the screw and nut is a steep undercut. Screw is held positively in the nut when the vise is clamped.

Write for Bulletin No. 24-AM
CARDINAL MACHINE COMPANY
1819 Dana Street
Glendale, California

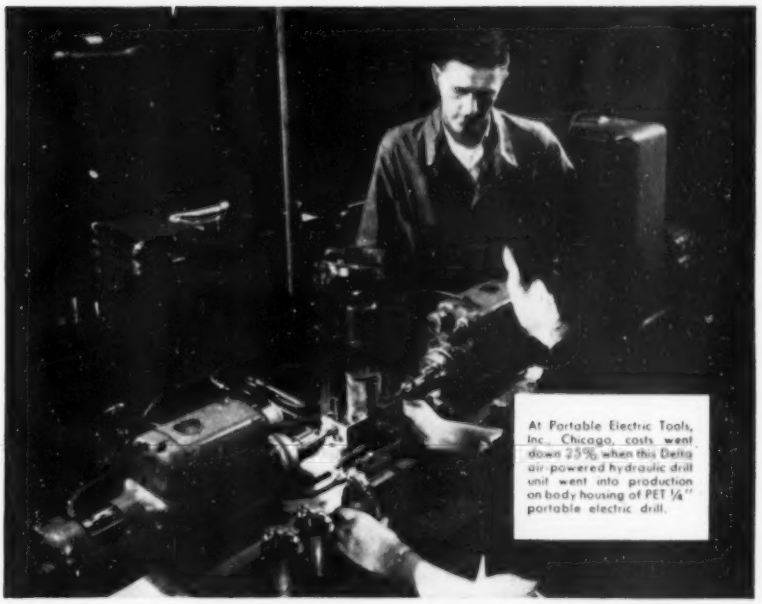
makes perfect, as the saying goes. So it is in this work of studying individuals. All of us have different temperaments and ways of doing things.

Must a foreman know all this, you ask? The answer is that the good foreman does. He does most of it subconsciously, but he becomes a judge of men and their abilities. Perhaps again some foremen are better equipped to make an analysis than others. Guidance can be given by higher supervision to the foreman just as the foreman, in turn, guides his workers. Everything in industry is built up on the basis of a cooperative team. When this idea is not carried out, the complete success of a company is not reached. Sure, we see companies going merrily along with internal friction, but this is not all the answer. Think how great those same companies could become if there was complete cooperation.

We are to think about whether a man should be given a job which he has never done before instead of giving it to the oldtimer who has always been doing that work. Two things to consider seem to come quickly to mind.

The first, suppose the oldtimer should not be available, sick, or decides to retire. What then? Does the plant close down? No, that is when we see the younger men stepping forward and doing the job. Perhaps not as efficiently at first and certainly not as quickly, as short-cuts are learned over the years, but they do handle the job. Some day the fellow who has never handled the job will necessarily have to have a try at it.

The second thing is, if a company does not bring along the younger workers they find themselves badly crippled as the old-timers disappear from the ranks. It is far better to train workers with experienced men than to have a group of untrained workers floundering along with no


At Portable Electric Tools, Inc., Chicago, costs went down 25% when this Delta air-powered hydraulic drill unit went into production on body housing of PET ¼" portable electric drill.

Portable Electric Tools, Inc.

Cuts Production Costs 25% with DELTA Air Hydraulic DRILL UNITS

Portable Electric Tools, Inc., of Chicago combined two model 19-150 Delta Air-Powered Hydraulic Drill Units and a standard Delta drill press table to build a simplified, single-purpose production machine. Their aim was to increase unit production and cut operating costs.

The principal operation performed on this machine is the simultaneous boring of two brush holder holes in the PET "Super-Duty" ¼" portable drill body. Exacting accuracy is required because these holes are then used for locating the part for all other machining operations on the aluminum castings.

HERE ARE THE RESULTS:

"The Delta hydraulic drill unit has given us more than 25% production savings," says Walter Sundberg, Superintendent of Production Machining.

Tolerances held are plus .0005 and minus .0000.

Average output per hour, 150 bodies. No mechanical, service or maintenance problems, even when the machine has run three shifts for long periods.

Women workers with no previous experience operate the machine.

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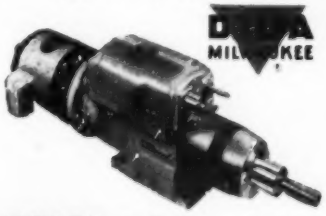

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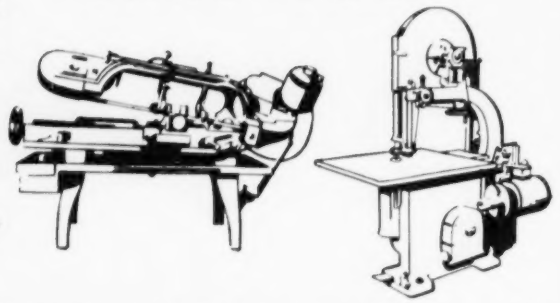

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one to guide them. Yes, the answer is run a training school. Let the workers who know how to handle themselves help the younger men along. It pays dividends.

The foremen can certainly pick those individuals who are capable of doing a good job. They will make mistakes; we all do, since no one is perfect. Know your workers and know your foremen, then guide them to help you do a better job for the company. No one gets something for nothing.

Charles D Townsend
West Hartford, Conn

NEW BOOKS

PROFITABLY USING THE GENERAL STAFF POSITION IN BUSINESS—*By Lyndall F Urwick, assisted by Ernest Dale. Published by American Management Association, 330 W 42nd St, New York 36, N Y. 35 pages, 6 x 9 in. Paperbound. Price $1.00 (AMA members); $1.25 (non-AMA-members).*

This booklet is No. 165 in the General Management Series, and is a report read at the General Management Conference held in New York in June, 1953.

Subject matter begins with a brief discussion of the meaning and derivation of the term "staff," tracing the concept of military staff functions back to earliest antiquity. Troubles frequently encountered in staff jobs are then outlined, and the proper function of a staff assistant is described.

Finally the booklet examines in detail the company structure and staff organizations of two large corporations.

Treatment of the subject is mainly in table and outline form, with many descriptive illustrations.

"Stop day-dreaming, Joe! Can't you see the boss is taking his lunch hour nap?"

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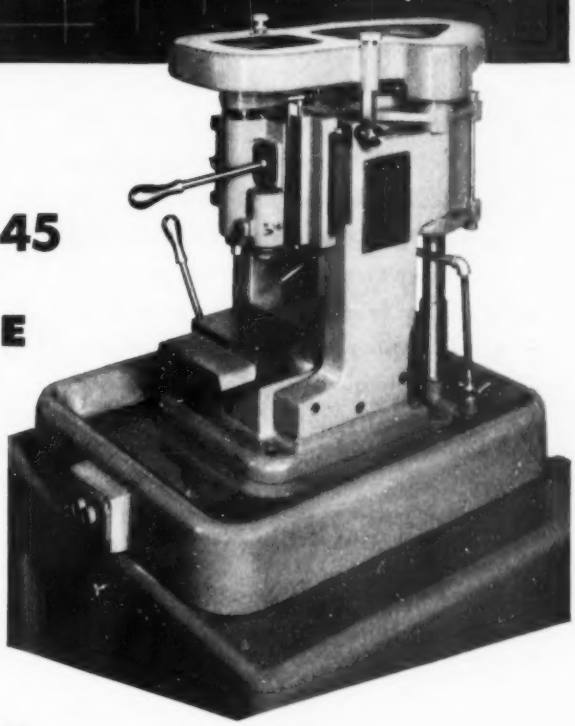

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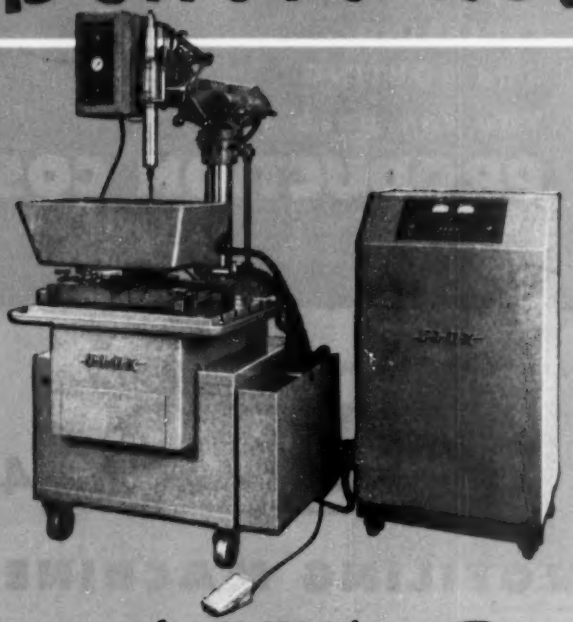

For over a month now top men in the metalworking industry have been coming to Detroit to watch the most amazing performance of a precision machine tool. Shown by appointment only, the new Elox M-400 Electronic Type Machine tool has reached into the future and revolutionized precision hard metal machining. Secretly shop-tested for over a year by exacting people in the tool and die industry, the powerful M-400 has produced hundreds of machining jobs heretofore considered impossible or impractical cost-wise. Its speed, surface finishes, unusual applications have astounded the most skeptical.

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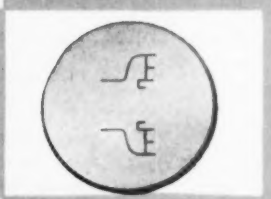
We made the machine, we've seen it produce beyond our expectations but we don't know what to call it! Give us your suggestions for a name . . . you win $500. Best applications . . . $500. This is a contest open to anyone except employees of Elox, its advertising agency or members of their families. Entries must be in by Dec. 1, 1953.

a few M-400 jobs

Stamping Die held to within .001" of electrode size proving any shaped hole drilled as easily as a round hole. A savings of $400 was realized thru use of the M-400.



Extrusion Die held to within .002" polishing stock on a side.

Powdered Metal Pressing Die finish machined by the M-400.

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Increases capacity 25% to 50%

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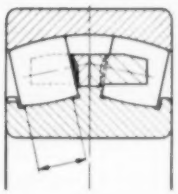

This is the Spherical Roller Bearing design originated by SKF *more than 30 years ago.* The cross-section shows how the integral inner ring flanges, and the undercuts adjacent thereto, limit the effective length of the rollers.

Now, SKF, originator of the Spherical Roller Bearing, has again provided industry with another anti-friction *first.*

This time, it's a revolutionary design advance in Series 222 and 223 bearings providing these advantages:

When designing new equipment, you can obtain the desired life by using smaller or lighter bearings at considerable cost saving. In addition, this forward step in design will carry heavier combinations of radial and thrust loads, or pure thrust loads of greater magnitude. The important self-aligning feature of SKF Spherical Roller Bearings has been preserved, so that considerable misalignment between the shaft and housing has no ill effect whatever on bearing capacity or life.

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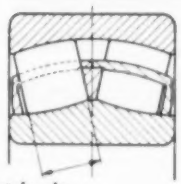

Here is the latest SKF improvement, a *revolutionary advance in design.* Effective roller guiding is accomplished by means of a separate ring. The need for undercuts is eliminated! This type of guide ring permits the rollers to take the position which their contact with the rings dictates. This assures uniform load distribution over the entire length of the longer rollers at all times. *Result* — greatly increased capacity and life.

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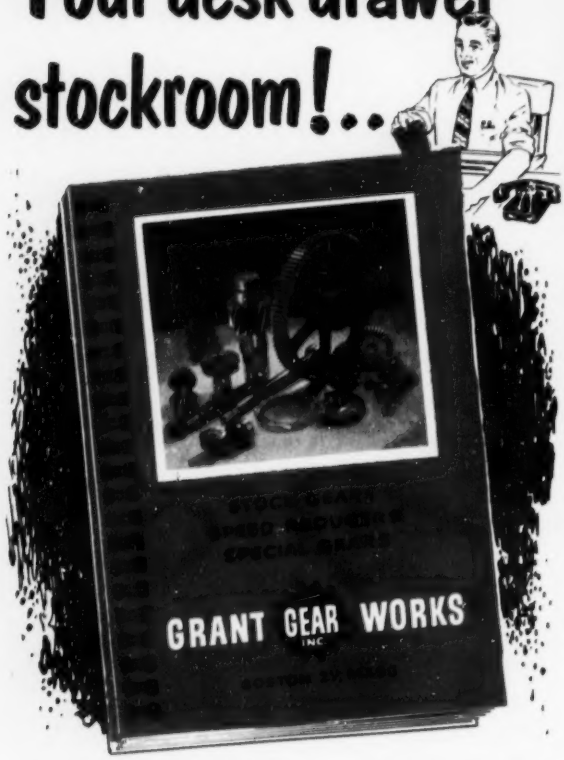
Your desk drawer stockroom!...



Yes, you can keep your stock of gears right in your desk drawer. It's simple with the new Grant catalog. There's no need of *carrying* a large inventory of gears *on hand* when you can find what you need at Grant—with delivery made to fit your schedule.

Whether it's gears, sprockets, or speed reducers, you'll find what you need in this new catalog. Better get a copy for your desk drawer now.

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You can depend on over three-quarters of a century of Grant experience to produce custom gears to your specifications.

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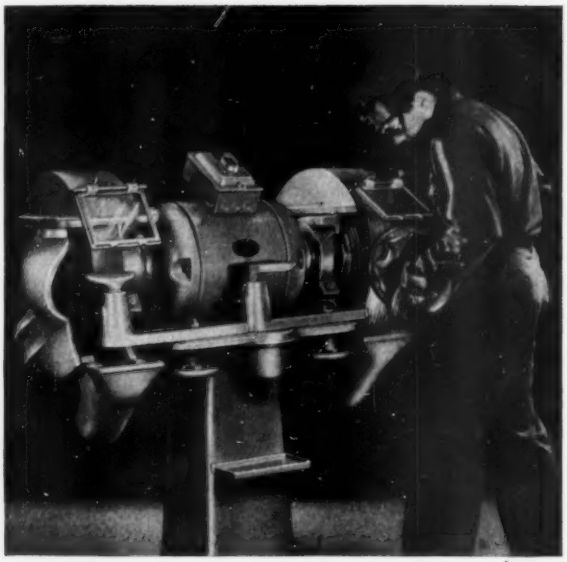

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...where you want to reduce costs

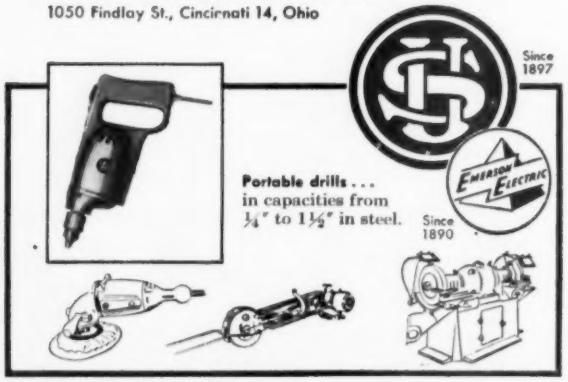
Check these U. S. Electrical Tool features—there are many cost-saving advantages in operating ruggedly-built Model 500 Grinders.

Standard equipment includes totally enclosed motor, 1 to 5 H.P., push button starter providing overload protection, ball bearings enclosed in dust-tight housings, enclosed adjustable wheel guards, tool tray and lift-out water pot. Eye shields and grinding wheels furnished as extra equipment. Furnished for 220/440 volt, 60 cycles, 2 or 3 phase AC.

Model 500 Grinders are available from stock for immediate shipment.

The U. S. Tool line is complete, ranging from hand drills, sanders, grinders and buffers to heavy-duty snagging grinders. If you don't know your nearby U. S. Distributor write at once for his name and free Tool Catalog No. US 29

United States Electrical Tool Division
THE EMERSON ELECTRIC MFG. CO.
1050 Findlay St., Cincinnati 14, Ohio



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Takes off metal whiskers 6 times faster

...IMPROVES QUALITY

Your Problem may be far removed from the deburring of electric shaver heads . . . but, if it involves cleaning or finishing of any kind, the answer may be found quickly with the help of your **O**sborn **B**rushing **A**nalyst.

Here, he helped convert a hand operation to automatic power brushing that greatly improved the product and increased output.

The job: To remove fine burrs at the slots of shaver heads and blend the surface junctures at the ends. The **OBA** helped develop the application of two Osborn brushes to an automatic "push-button" operation. Shaver heads are mounted in clamp fixtures on a rotating table. One brush runs clockwise and the other counter-clockwise, producing perfectly smooth, uniform surfaces. One operator turns out more than 1000 pieces per hour, compared to an output of about 150 per manhour formerly.

An Osborn Brushing Method can benefit *your* cleaning and finishing operations. Call your . . . **OBA** or write *The Osborn Manufacturing Company, Dept. C-11, 5401 Hamilton Ave., Cleveland 14, Ohio.*

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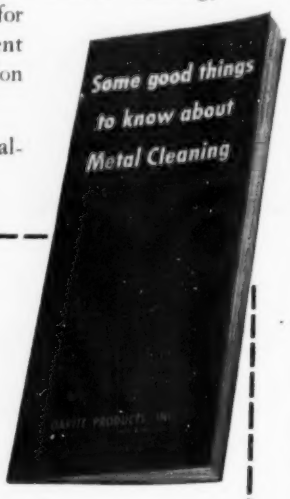
We thrive on questions about tank and machine cleaning, electrocleaning, pickling, preparation for painting, paint stripping, steam-detergent cleaning, barrel finishing, rust prevention and related subjects.

There's space below for asking your metal-cleaning question.



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☐ **ALSO** send me a **FREE** copy of your booklet "*Some good things to know about Metal Cleaning.*"

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Microstructure determines tool life . . .

U. S. AIR FORCE MACHINABILITY REPORT 1951

This *American Machinist* Special Report summarizes recently released data from the $100,000 machinability - research project conducted by Curtiss-Wright and other companies for the United States Air Force.

You will find particularly valuable, as a key to estimating the tool life cutting speed of any steel, this report's comprehensive chart of 12 steel structures under four metallurgical conditions.

Copies of this 8-page Special Report, which includes information on machinability as influenced by heat-treating and alloying, are available at 15 cents each.

Write for an editorial reprint order form listing titles and costs of other informative Special Reports.

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Automatic Profiling of CAMS AND CAM-LIKE SHAPES

Gorton Contour Mill, CM-12, Produces Extreme Accuracy and High-Surface Finish with Minimum Maintenance

This machine produces highly accurate, identical pieces — complicated cam shapes, external or internal, or continuous grooves and slots of irregular radii. The Gorton Contour Mill is easy to use and versatile — a simple tracer-controlled, vertical-head milling machine with two rotary power-driven tables. No complicated electronic, hydraulic or pneumatic controls.

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Wide spindle-speed range — 300 rpm to 10,000 rpm — for either high-speed steel or carbide cutters, burrs or grit grinding wheels. The 16-inch master-copy table easily accommodates larger master cams. Several thin cams can be stacked and profiled at once.

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Operation depends upon a heavy, single-pivot beam which provides more accuracy than can be built into the tooling. A choice of several reduction ratios adds to accuracy and provides low micro-inch finishes. The reduction ratio principle produces piece parts to closer tolerances than those of the master.

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The basic machine is standard, but each mill is tooled for specific work. Because all machine elements are individually motor-driven, the machine can be adapted to a wide range of applications. Write for complete details and your copy of Special Bulletin 2380-C-1510.

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In operation, parts to be dried are placed in a well ventilated motor driven rotating basket. Free liquid is immediately thrown off by centrifugal force and any moisture remaining on parts is absorbed in the shortest possible time by the large volume of expanded air continually forced over and through the contents. Provision is made for heating and expanding, also boosting the flow of incoming air to assure faster absorption of moisture. With the large exhauster provided, heated air is not always required.

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It will pay to investigate the advantages offered by Barrett Centrifugal Dryers on your work.

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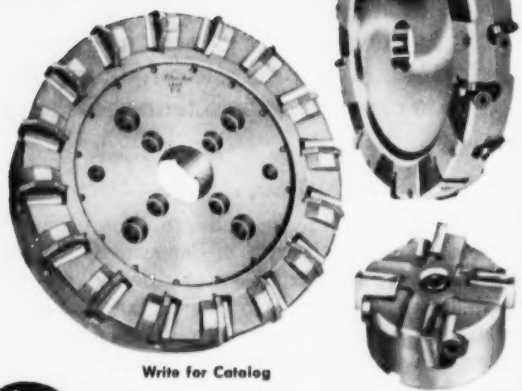
With the "FUTURMILL" the indexable solid carbide blade milling cutters.



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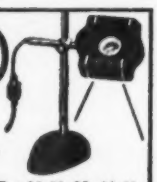

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SPECIFICATIONS

Swing — 10" over bed

Collet Capacity — ⅝" max.

Spindle Bore — 27/32"

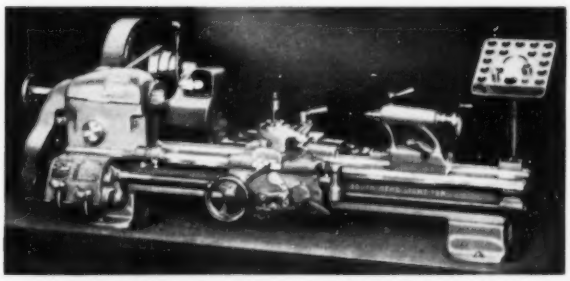
Distances Between Centers
Bench models — 16⅛", 22⅛", 28⅛", 34⅛". Toolroom bench models — 16⅛", 22⅛", 28⅛". Floor Models — 22⅛".

Spindle Speeds (approx.)
12-speed drives — 48 to 1435 r.p.m.
16-speed drives — 52 to 1365 r.p.m.

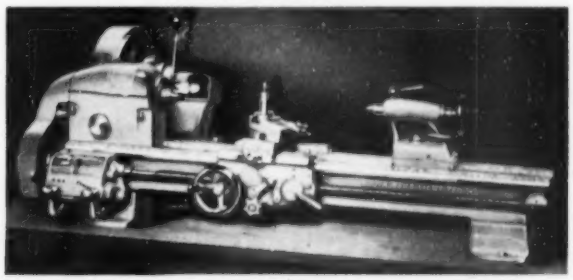
Power Longitudinal Feeds (R.H. or L.H.) Toolroom and Model A — 48, .0015" to .0853". Model B — 26, .0021" to .0155". Model C — 14, .0021" to .0156".

Power Cross Feeds (reversible) Toolroom and Model A — 48, .0004" to .0255". Model B — 23, .0009" to .0046". Cross-feed is hand operated on Model C.

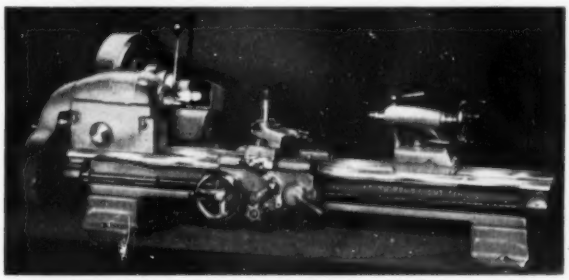
Light Ten Floor Lathe — Model A. 12-speed Underneath Motor Drive — Quick Change Gears. Worm drive apron with power cross-feeds.



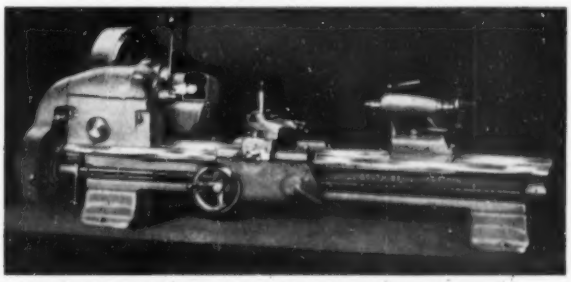
Light Ten Toolroom Precision Bench Lathe. Includes usual toolroom attachments.



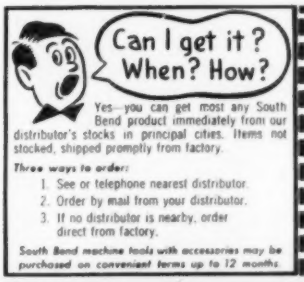
Light Ten Bench Lathe — Model A. Quick Change Gears. Worm drive apron with power cross-feeds.



Light Ten Bench Lathe — Model B. Independent Change Gears. Worm drive apron with power cross-feeds.



Light Ten Bench Lathe — Model C. Independent Change Gears. Plain apron with hand operated cross-feed.



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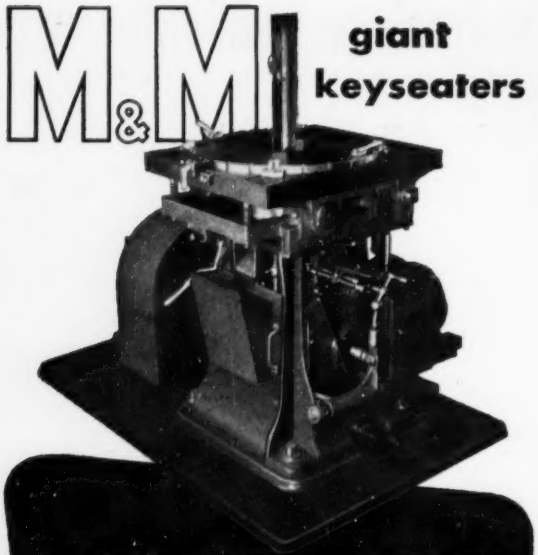
M&M giant keyseaters



M & M Giant Keyseaters, built in a range of sizes, speedily and accurately cut interval keyways or splines in the bores of pulleys, gears, fly wheels or any other machine part. Special fixtures and cutters are available for unusual shaped keyways and taper work. Send us your problems.

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Rugged construction—drop forgings, cast steel and solid bar stock.

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Wolverine Toggle Clamps also available in several types and sizes of Standard Action and Push Action units.

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Wolverine Clamps are in use in almost every major industrial field and are specified by prominent engineering firms. Write for Bulletin.

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Front Lever Bench Punches

These simple, rugged punches were designed to fill the need in several of the metal-working lines for a small, hand operated punch that would not only stand up under constant use but would also hold the punch and die in true alignment at all times.

Capacity: 7/16" hole through ¼" steel, or equivalent. Weight: 70 lbs. 65 sizes of punches and dies are carried in stock to fit. Immediate shipment.

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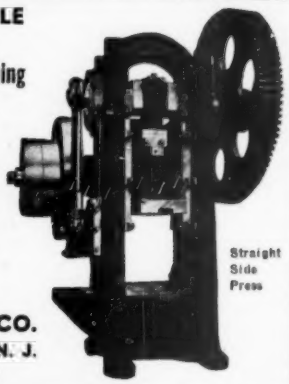
STRAIGHT SIDE SINGLE CRANK PRESSES for heavy blanking and forming

Heavier classes of blanking and forming work can be handled efficiently and economically on these presses.

Sturdily constructed with either solid frame or built up with tie rods. Small elastic deflections do not affect tool alignment. All stresses taken centrally. Made also with wedge adjustment for slide for very close work.

Full details on request.



Straight Side Press

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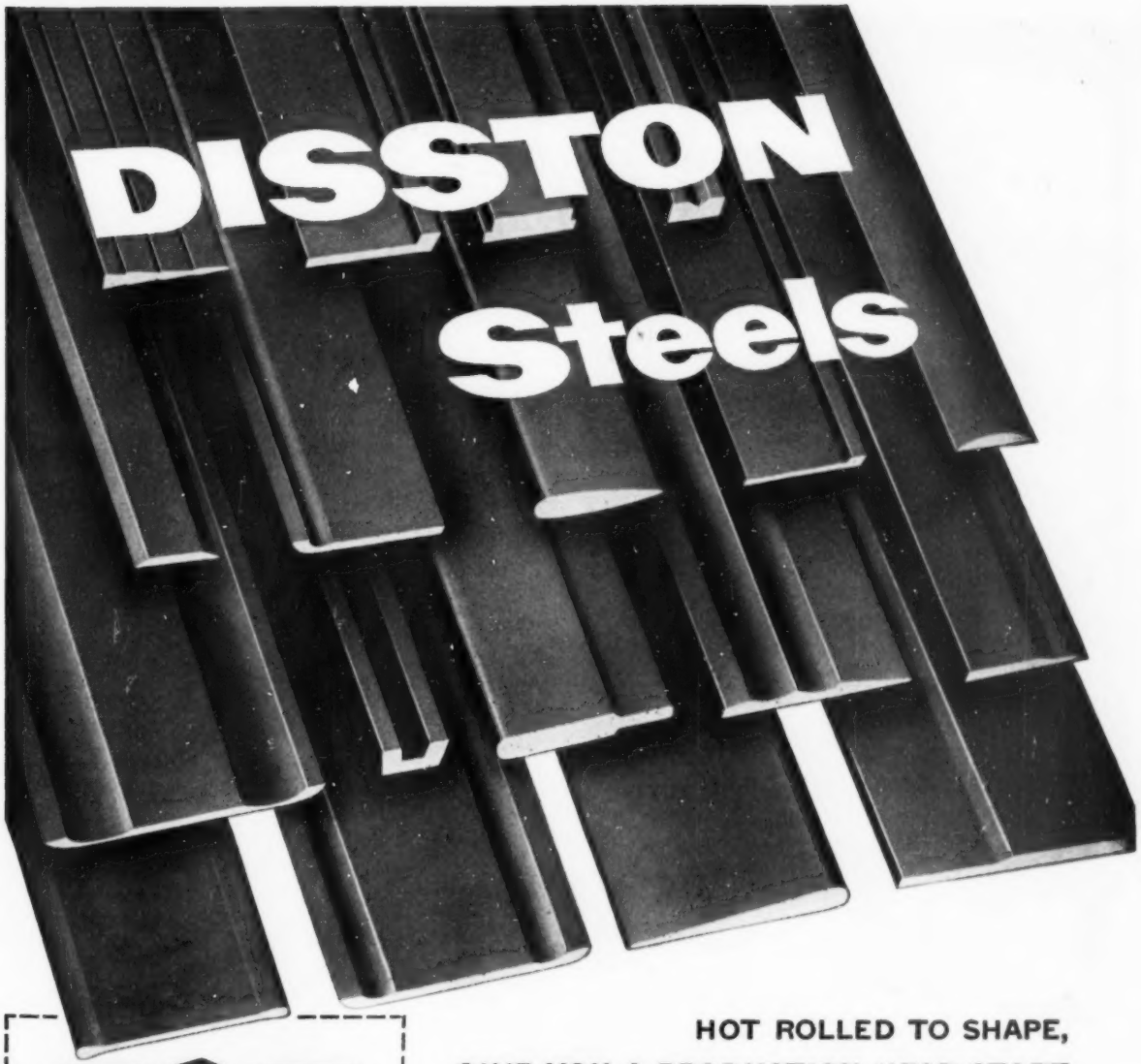

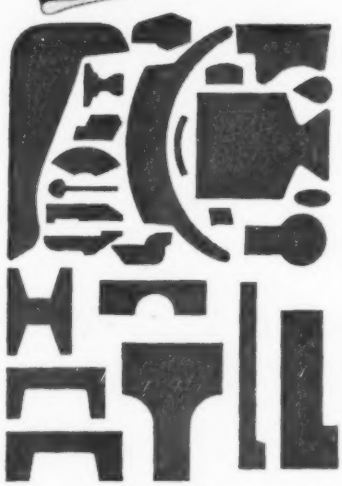

A few of the many forms of Disston Hot Rolled Shapes now being used in industry.

HOT ROLLED TO SHAPE, GIVE YOU A PRODUCTION HEAD-START

It may be money-saving news to you that Disston can relieve you of much of the overhead in machining by delivering Disston Hot Rolled Steel Shapes to meet or closely approximate your specifications. These steel- and labor-saving shapes can be rolled in a variety of forms that should easily offer production short-cuts to you. Tolerances are close, and finishes are exceptionally fine. Disston Shapes can be made in either alloy or carbon steels, both electric and open hearth grades. Disston engineers and metallurgists are ready to work with you today. Write us, giving your needs.

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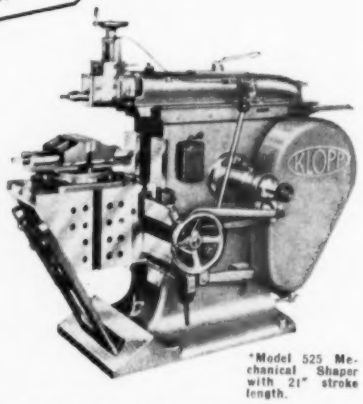
108 busy plants are cutting machining costs with KLOPP High-Production Shapers



*Model 525 Mechanical Shaper with 21" stroke length.

Bulky, awkward-to-handle work pieces are easily accessible and simple to set up in the KLOPP. It's built for high-speed, too, by Europe's largest manufacturer of shapers.

MECHANICAL SHAPERS — stroke lengths 15", 21", 27". Has six rates of speeds with normal motor, 12 with two-speed motor; accelerated return motion. Single lever control is within easy reach of operator. Swivel work table can be set to either side at any angle up to 90°.

FULLY HYDRAULIC MODELS — stroke lengths 26", 35⅜", 39½". Infinitely variable ram speeds with quick return and minimum power consumption. Central operator control panel. Tool holder with graduated scale swivels 45° to either side. Self-acting downfeed of tool slide. Automatic tool lifting device included.

Engineered servicing from Orban Service Centers in Cleveland, Detroit, Newark. Stock parts from Cleveland.

KO **KURT ORBAN** COMPANY, INC.

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Branch offices and distributors from coast-to-coast

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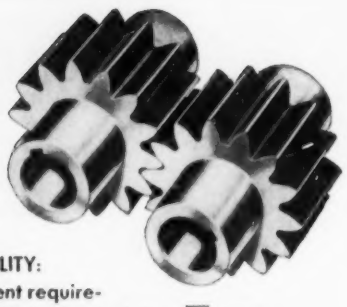

In gears, HQ stands for HIGH QUALITY:
HQ gears must meet the most stringent requirements, must do the toughest jobs efficiently. And for the best in custom-made HQ gears — *where quality really counts* — many smart gear buyers rely on The Cincinnati Gear Company. Each gear is individually made to meet specific requirements, produced to exacting standards, and backed by Cincinnati Gear's reputation for producing only good gears. If your next job demands HQ custom gears, write, wire or call today for further information.

- SPUR
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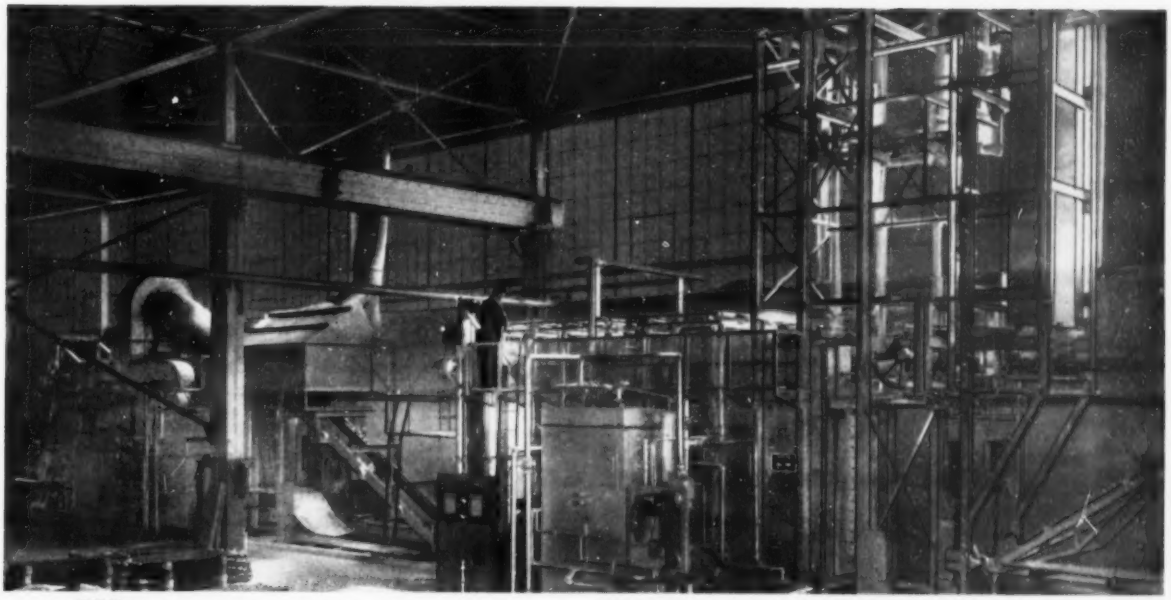
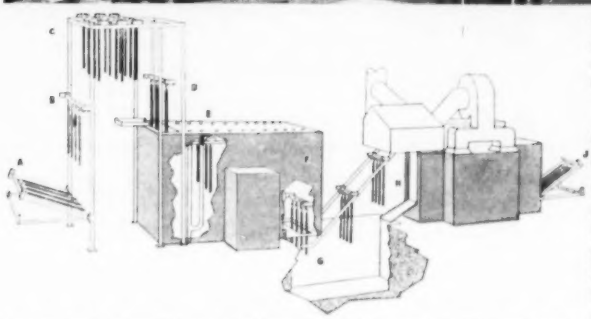
HOW SUNBEAM INDUSTRIAL FURNACES MEET THE DEMANDS ON THE PRODUCTION FRONT

HEAT TREATING HIGH-STRENGTH TORSION BARS

AT MAREMONT AUTOMOTIVE CORP., Chicago, Ill.





Bars are hooked onto carrier on pivoted frame A, brought to a vertical position and raised 28 ft. by elevator B where transfer mechanism C positions them over furnace door. A second elevator D lowers carrier into furnace where drag chains pull it through furnace E and onto elevator in discharge chute F. Suspension of bars during heat treatment prevents distortion. Bars descend into oil quench G, and leave at a temperature of 300° to 500° F. They then move up on roller conveyor chains to tempering furnace H. From this forced convection unit they are lowered to a horizontal position by the pivoted frame J for unloading.

The Sunbeam Stewart furnace line consists of a gas-fired, radiant-tube, atmosphere-controlled hardening furnace followed by an automatic quench, and then a forced-type convection, recirculating tempering furnace. The unit occupies an area about 91 x 15 ft. The furnaces are about 12 ft. high.

Automated handling of bars and close process control maintain production with few rejects

Torsion bars for track-laying vehicles must be strong, hard, tough and straight. Due to their extreme length-to-diameter ratio (24 to 102 in. long) torsion bars at Maremont are processed vertically to prevent sagging or distortion. Handling and heating in this Sunbeam Stewart continuous heat-treating line are automatic from the time bars are placed on a horizontal charge table until they are lowered onto a discharge table.

Although this installation was designed for automatic heat treatment of high strength torsion bars, it is ideally suited for handling any heat treated products having a high length-to-width ratio where full hardness with maximum toughness must be maintained while holding distortion to a minimum.

IF YOU ARE CONSIDERING DEFENSE WORK CALL SUNBEAM. Designs are available for heat treating the following materiel:

SHELLS: 57MM; 75MM; 90MM; 105MM; 120MM; 155MM; 3", 5", 6", 8" Navy Shells (Harden, Quench and Draw).

FORGINGS: Rotary Hearth and Pusher-type Forging Furnaces.

ARMOR PIERCING SHOT (Harden, Quench and Draw).

CARTRIDGE CASES (Anneal, Stress Relieve).

MACHINE GUN CLIPS (Harden, Quench and Draw).

JET AIRCRAFT and TANK PARTS

Sunbeam CORPORATION (Industrial Furnace Division)

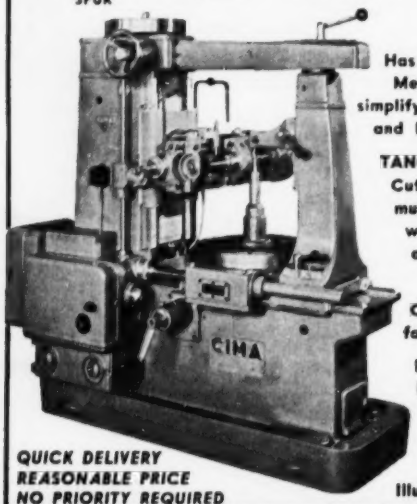
***Main Office:* Dept. 119, 4433 W. Ogden Ave., Chicago 23—*New York Office:* 322 W. 48th St., New York 19—*Detroit Office:* 3049 E. Grand Blvd., Detroit 2**
***Canada Factory:* 321 Weston Rd., Toronto 9**

A letter, wire or 'phone call will promptly bring you information and details on SUNBEAM industrial furnaces, either units for which plans are now ready or units especially designed to meet your needs. Or, if you prefer, a SUNBEAM engineer will be glad to call and discuss your heat treating problems with you.

CIMA UNIVERSAL GEAR HOBBING MACHINE

CAPACITY 20" DIA. 5 D. P.

SPUR SPIRAL WORM GEAR WORM



Has DIFFERENTIAL Mechanism to simplify cutting spiral and helical gears.

TANGENTIAL Feed Cutter Head for multiple-thread worm gears and worms.

Employs CLIMB CUTTING for better finish.

Power Feed and Rapid Return in all directions - Quick set-up.

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QUICK DELIVERY
REASONABLE PRICE
NO PRIORITY REQUIRED

GEORGE SCHERR CO., Inc.
COMPLETE LINE OF PRECISION INSTRUMENTS
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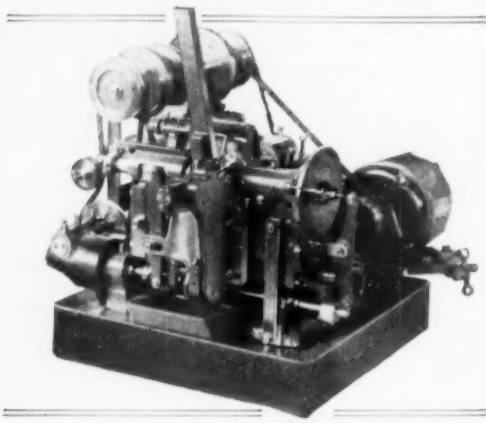
WALTHAM
PINION AND GEAR CUTTING MACHINES



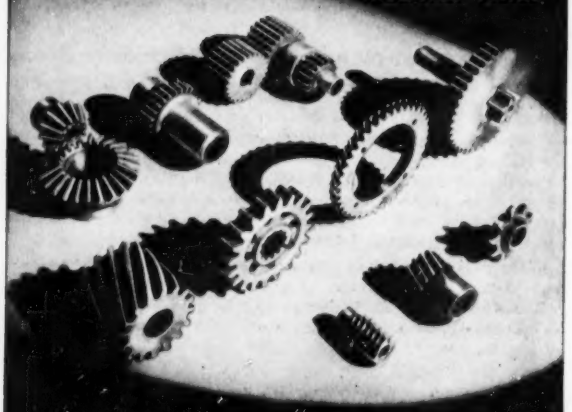
Fast, Convenient, Compact, Accurate

Designed to make high speed production of small gears and pinions available for assembly in watches, instruments, gauges, fuses, etc. Made in Single-Cut, Multiple Cut and Magazine-Feed types. Simple to operate; require no special skill.

Send for detailed information and complete specifications.

WALTHAM MACHINE WORKS
High Street, Waltham, Mass.

25th Year of Continuous
GEAR *Production*
for Aircraft *and* Industrial Fields



A complete plant equipped with over one hundred major machine tools for gear production.

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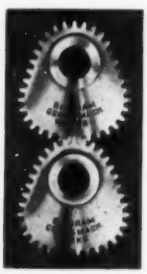

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BILGRAM TRADE MARK

Including: Elliptic and Oval Gears

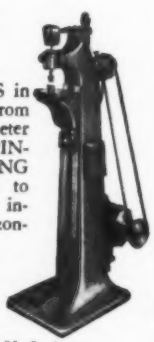
Also: Every Type of Gear
Any Quantity—Any Material

BILGRAM GEAR & MACHINE WORKS
1217-35 Spring Garden, Philadelphia, Pa.

GRANT

RIVETERS — PIONEERS in their line—head rivets from smallest to ¾" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.



THE GRANT MFG. & MACHINE CO.
85 Silliman Ave., Bridgeport, Conn., U. S. A.

PRODUCTION JUMPED

from 12 pieces per hour to 90 pieces per hour on this part

when Perkins Machine and Gear Co. switched to SUNNEN HONING

PROBLEM: To step up production of a splined bore, which required both correction of heat-treat distortion and final sizing.
MATERIAL: 4130 Steel
HOLE DIAMETER: .470″
HOLE LENGTH: 1.0″
HARDNESS: Rockwell "C" 55
STOCK REMOVAL: .001″ to .002″
FINISH: 32 RMS (approx.)
TOLERANCE: +.001″, −.000″

SOLUTION: Sunnen Model MBH-1290D Honing Machine with a Y12 keyway type honing unit and honing stone, using mineral honing oil. Semi-skilled labor is used.

RESULTS: 90 parts per hour including gaging time—an increase of 650% by switching to Sunnen Honing (previous method was to hand grind and polish). Tolerances for straightness and roundness are easily held; surface finish is quite satisfactory. This shop finds Sunnen Honing the right answer for many jobs that require sizing and finishing of internal diameters.

TYPICAL HONED PARTS

Cast iron hydraulic cylinder

Bronze motor bearing

Steel worm gear

SUNNEN PRODUCTS COMPANY
7928 Manchester Avenue, St. Louis 17, Missouri
Canadian Factory: Chatham, Ontario

In plant after plant Sunnen Honing Machines have been the solution to production problems that could not be handled by drilling, reaming, boring, lapping, or grinding.

You'll find them economical for job lots as well as long production runs . . . for de-burring as well as micro-fitting . . . for producing holes to engineering specifications as well as for eliminating manufacturing bottlenecks.

These machines generate geometrically perfect holes with fast stock removal . . . produce a guaranteed accuracy of .0001″ or better and surface finish to 2 micro-inches RMS . . . have a diameter range of ⅛″ to 2⅝″ . . . require no jigs or fixtures . . . are used in thousands of plants in production, tool room, maintenance, salvage. Average installation costs less than $1,000.

Sunnen Honing Machines may be *your* answer, too. Investigate now.

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Name.....
Company.....
Address.....
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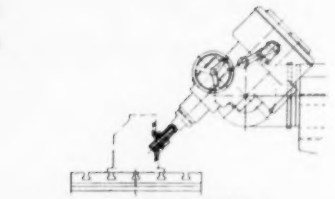
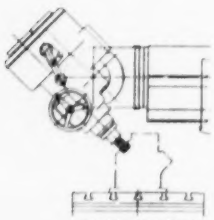
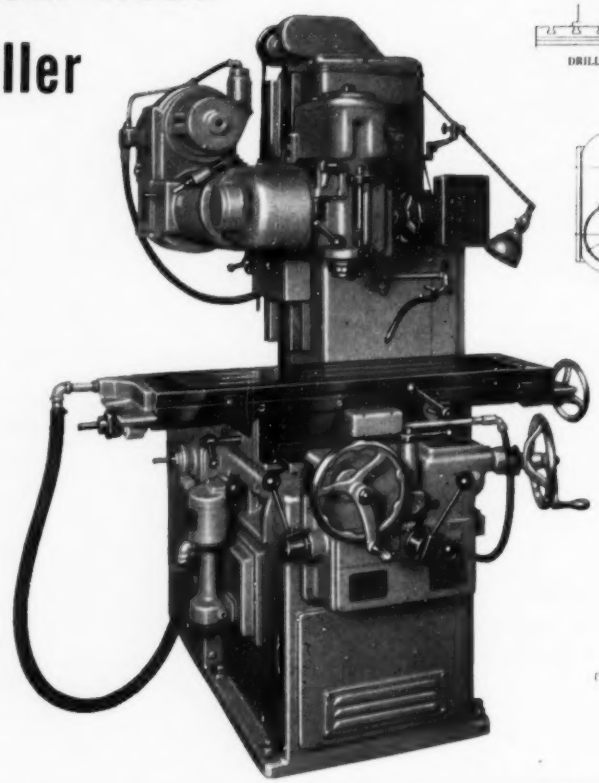
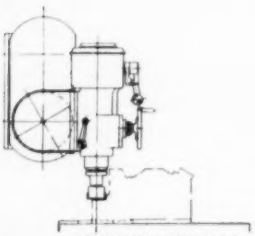
FASTER MILLING...from ANY ANGLE on REED-PRENTICE

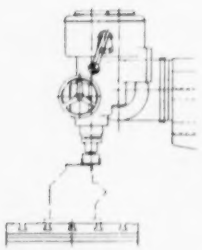
12V Universal Head Vertical Miller

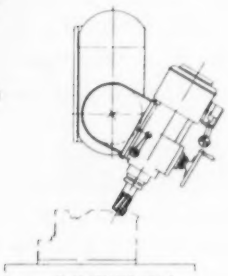

DRILL BORE AND REAM AT 45°


MILLING SLOT AT 45°




CROSS FACE MILLING AT 90°


FACE MILLING AT 90°


CROSS MILLING AT 30°

Universal head on the Reed-Prentice 12V Vertical Miller speeds up milling operations by saving valuable set-up time. Head adjustment up to 45° front and back and 30° left and right permits rapid milling from any angle.

Easy to reach central pushbutton panel gives instant *electronic* control of infinitely variable feeds and spindle speeds. The Reed-Prentice 12V is particularly adapted for machining plastic and rubber molds, die casting dies, forge dies, jigs and fixtures.

Get full details on the versatile 12V Miller now. Send for Bulletin #953.

SPECIFICATIONS

CAPACITY

Max. distance Table to face of spindle	18"
Max. distance Spindle to column	26"
Min. distance Spindle to column	12"

HEAD

Infinite speeds	90 to 2200
#40 NMTBA taper in spindle	
Head swivels (F&B)	45°
(L&R)	30°
Vertical Travel of spindle	5"

RANGE

Longitudinal travel	28"
Cross Travel	12"
Vertical Travel	14"

Size

Working surface	12" x 46"
3 T-Slots (spaced 3")	11/16"

FEEDS: Inches per Min.

Longitudinal	1/4" to 24"
Cross	1/4" to 24"
Vertical of ram	3/32" to 16"

SPINDLE DRIVE MOTOR 3 HP

REED-PRENTICE CORP. MACHINE TOOLS WORCESTER MASS. U.S.A.

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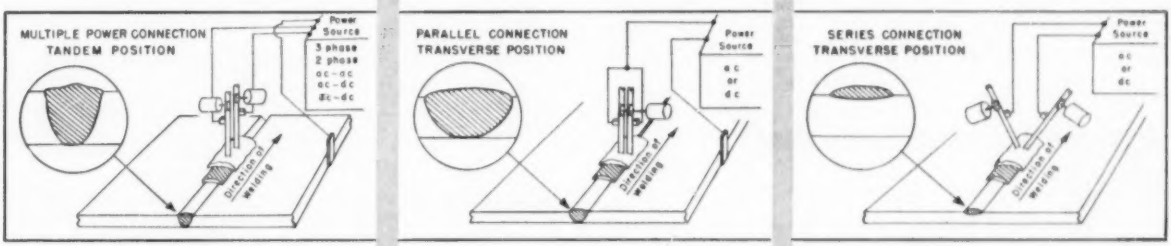
Multiple Electrode Welding

UNIONMELT Multiple Electrode welding with two or more electrodes in tandem, transverse, or other positions increases welding speeds up to three or four times faster than single electrode welding.

By using two or more electrodes in the same weld zone, magnetic reaction can be regulated to provide exceptional control over arc direction and weld shape.



Extra High-Speed Welds are made with multiple power connection and the electrodes in the tandem position. Speed is three to four times that of single electrode welding. This is particularly suited for welding long continuous seams, well-prepared and well-fitted, as in pipe, tanks, pressure vessels, and structural assemblies.

Extra Wide, High-Speed Welds are made with parallel power connection and the electrodes in the transverse position. Speed is twice as fast as for single electrode work. This is particularly useful for welding seams with gaps or other irregularities, as in center sills, ship plate, and heavy, hard-to-fit work.

Extra Shallow, Wide Welds are made with the series power connection and the electrodes in the transverse position. Speeds are many times faster than single electrode work and the dilution of the deposit is far lower than can be produced with a single electrode. This process will open new possibilities for surfacing and cladding all kinds of articles by automatic welding.

Complete UNIONMELT machines are available for multiple electrode welding and all UNIONMELT apparatus is designed for easy installation in any plant or factory. LINDE's engineers will be glad to determine how UNIONMELT Multiple Electrode Welding can best benefit you. Call your nearest LINDE office for more details on UNIONMELT Multiple Electrode Welding.

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A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
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In Canada: DOMINION OXYGEN COMPANY, LIMITED, Toronto

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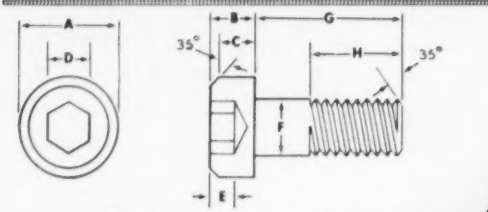
DESIGN ENGINEERING at YOUR Service..



MAC-IT PARTS COMPANY

MATERIAL SAE 4140 STEEL ALLOY-ROCKWELL
FINISH CHROMIUM PLATING ON STEEL G.M. 4251-
TOLERANCE IN LENGTH THE TOLERANCE IN LENGTH

A	B	C	D	E	F	G	H
1/8	.244	.229	.185	.127	.248	3/8	3/8

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Mac-it socket-head screws, providing strength without bulk, give lighter weight, streamlining, and more secure fastening to equipment you design. Whether the design problem involves standard or special screws, Mac-it will add to the appearance, efficiency and performance of the equipment. Use Mac-it Fastener Engineering Service for all problems involving screws for any type application

MAC-IT PRECISION

The precision manufacture and quality control used in making Mac-it Screws provide users with high dimensional accuracy and uniformity. All Mac-it Screws in both coarse and fine threads are held to a class-3 fit. Mac-it maintains a Fastener Engineering Service for the design, development and production of screws for all types of applications.

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Manufactured by Mac-it Parts Co., Lancaster, Pa.

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AND THE FOLLOWING IMPROVEMENTS HAVE BEEN ADDED
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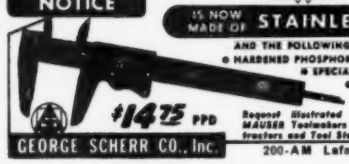
- 3 GRADUATIONS - 1/1000" - 1/128" - 1/10 mm in back



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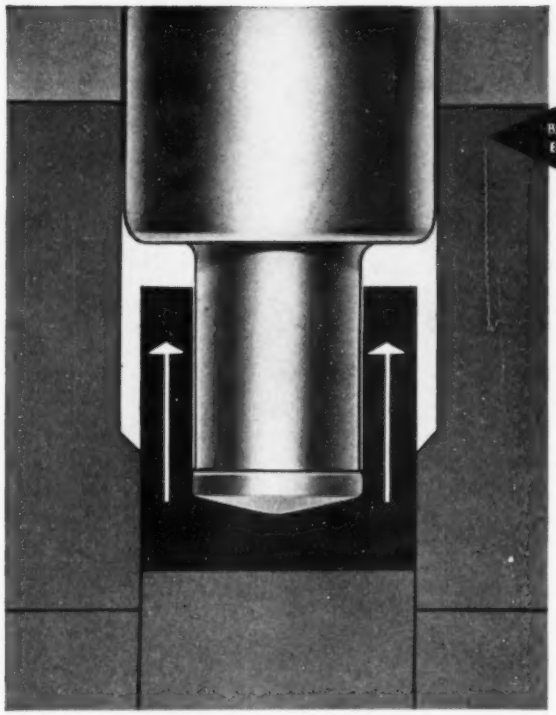

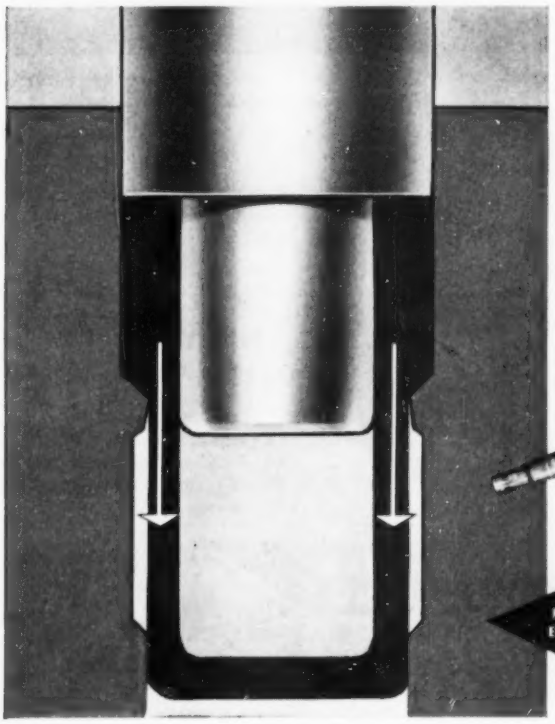

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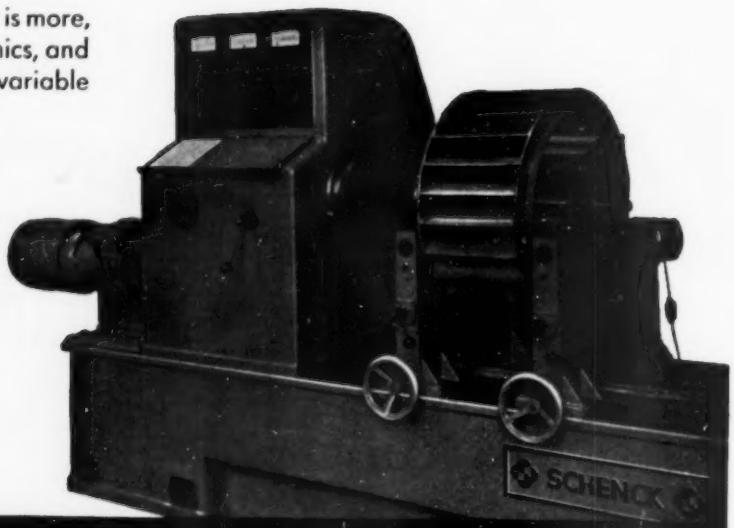

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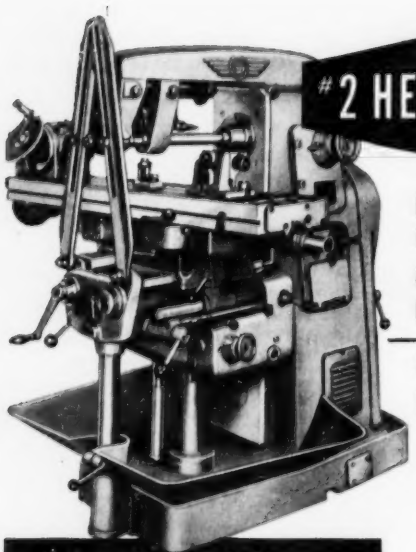

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for tool room & production work

work table 12" x 51"

immediate delivery

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TRiangle 5-2103 and 2157

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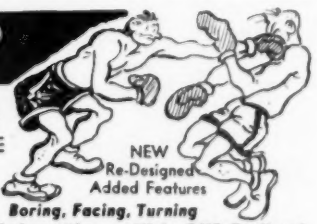

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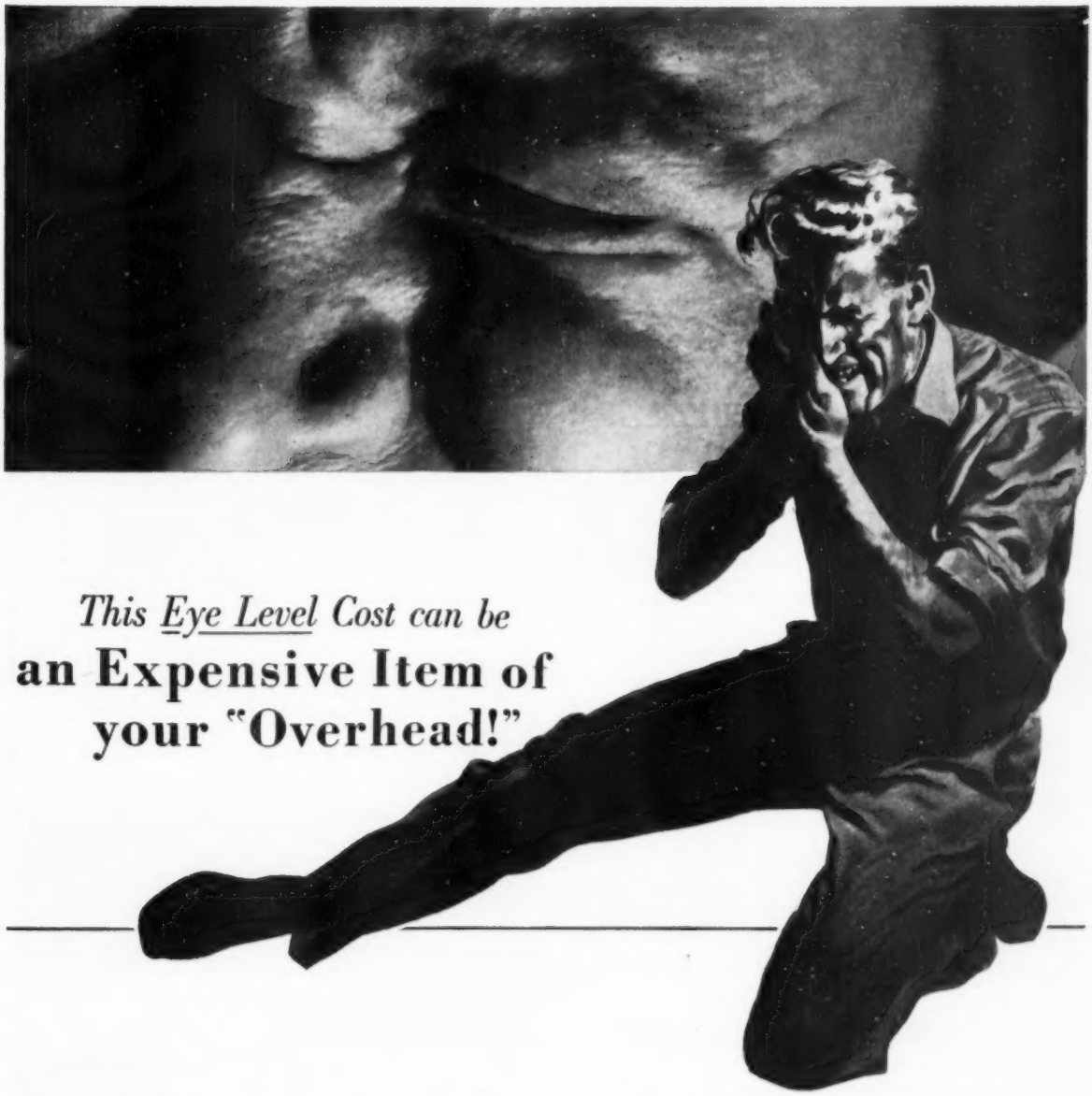

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Apart from compensation costs which have soared in recent years, and increased first aid and medical expenses, *you'll save:*

1 Lost man hours — very important in a tight, high cost labor market.

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What's the cost of eye accidents in actual money? More than $5.00 *per employed worker* per year. What's the cost of prevention? About $2.30 per *exposed* worker when a tested, proved AO Program is installed.

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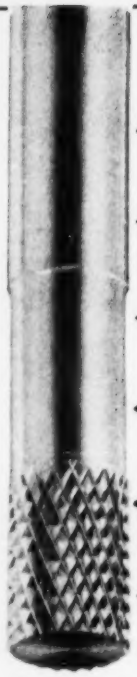
"Stay in the Safety Zone with AO Safety Equipment"

American Optical

SAFETY PRODUCTS DIVISION

Southbridge, Massachusetts

BRANCHES IN PRINCIPAL CITIES



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for CAPACITY PRECISION POWER

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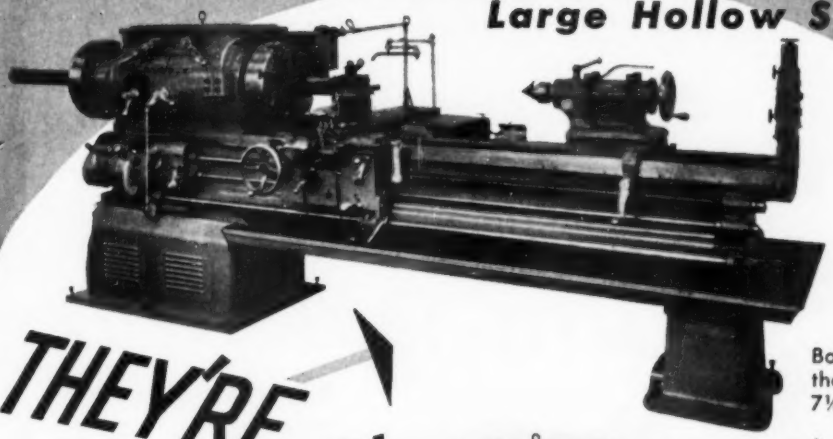
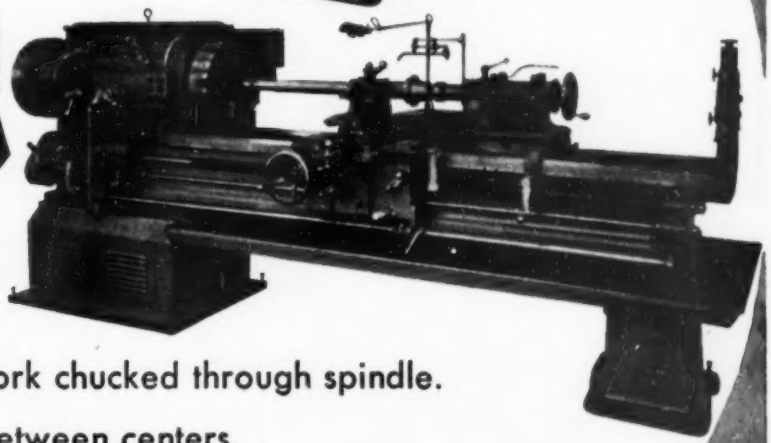
Large Hollow Spindle Type



Both Illustrations Show the 18" Hollow Spindle 7⅛" Hole

THEY'RE VERSATILE!



- Machine long work chucked through spindle.
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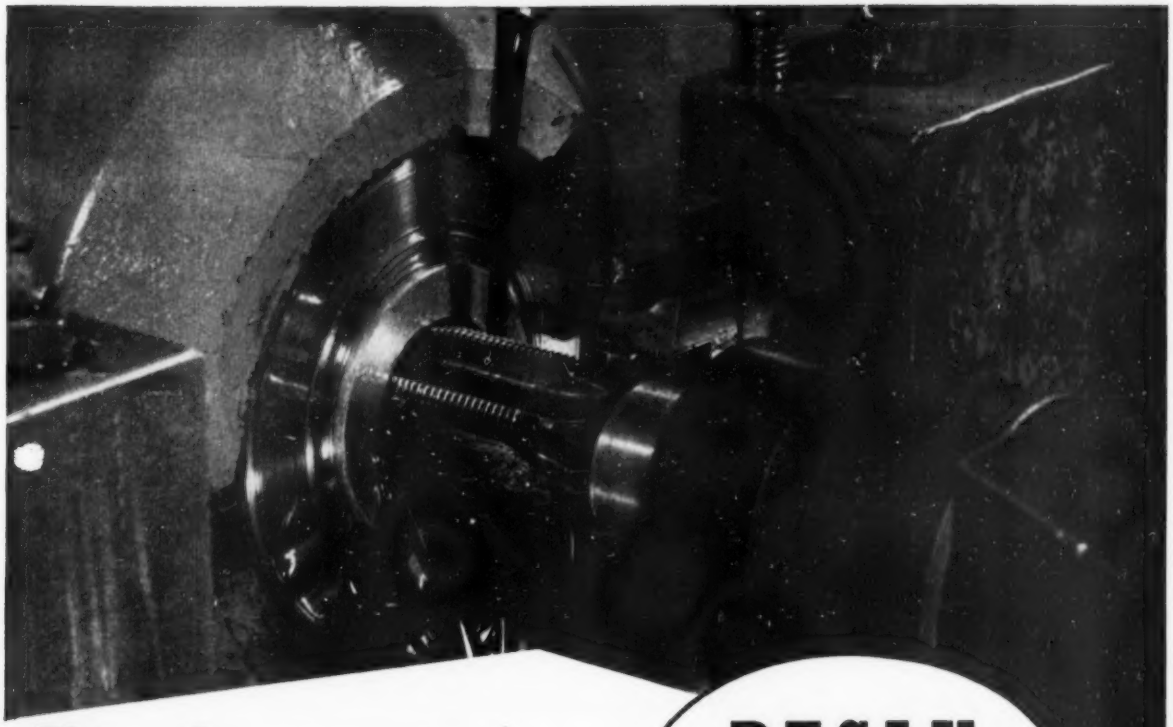

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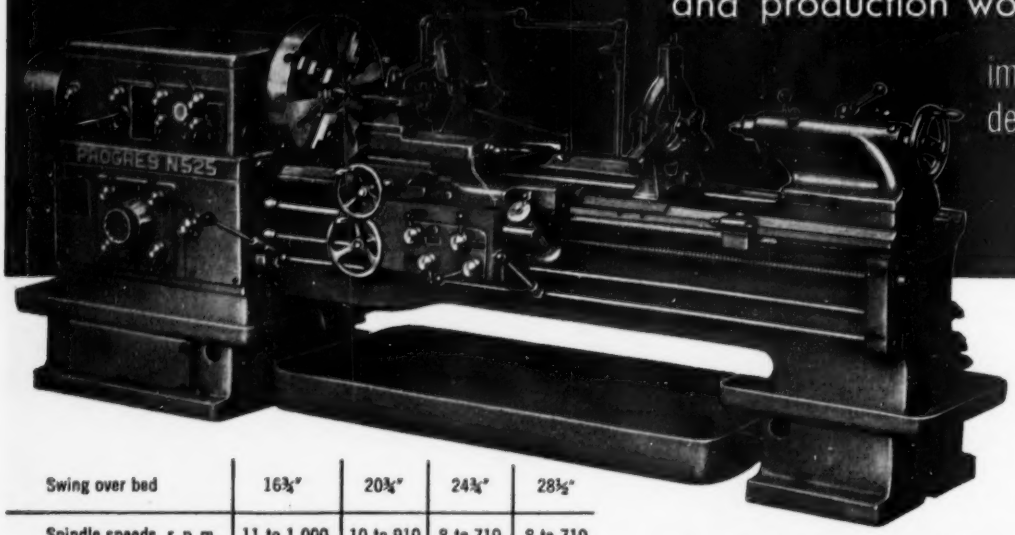

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Use this manual to make the winning but safe bids that mean more jobs and better profits for your shop.

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BY W. A. NORDHOFF
Douglas Aircraft Company, Inc.

488 pages, 488 illus., $7.00

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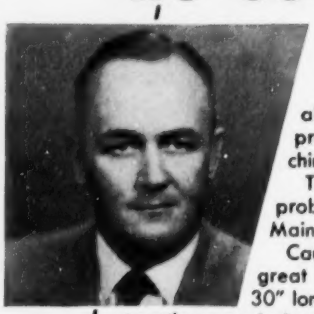

Erickson field engineers, like Dick Butts above, are trained to get the utmost in production and accuracy from your machine tools.

Typical is the solution to a "precision" problem at Saco-Lowell Shops of Biddeford, Maine . . . manufacturers of textile machinery. Cause of lost accuracy was an unusually great diameter-to-length ratio on rolls 24" to 30" long. They must fit perfectly when threaded together on spinning frames up to 52' long. Machining consists of drilling, reaming, and tapping to a .004" TIR from thread P.D. to roll O.D.

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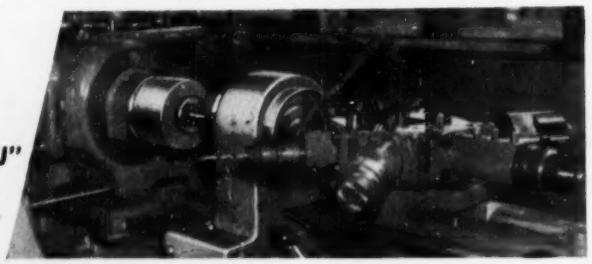

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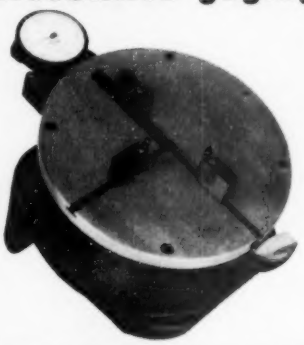
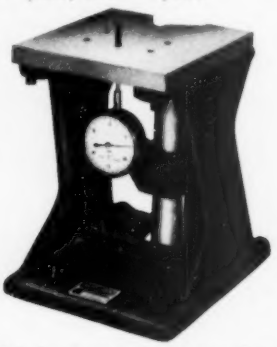
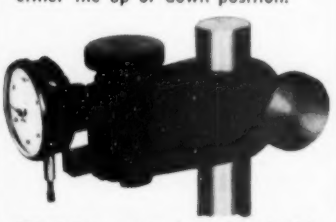


K7-R Bench Comparator with a fine setting adjustment will inspect either inside or outside diameters, on short or production runs, accurately and quickly. Available with several types of jaw arrangements, such as "T" plate (as illustrated), "V" plate, and "Y" plate.



TD-5 Comparator is a general purpose gage adaptable to a great many uses in the machine shop, tool room, and inspection department. Column may be mounted in either the up or down position.



STD-5 Comparator is equipped with a long range fine setting adjustment built integral with the indicator arm, giving all the advantages of the TD-5, plus.

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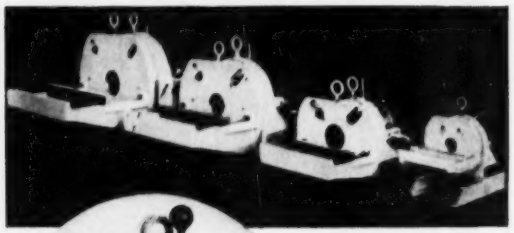
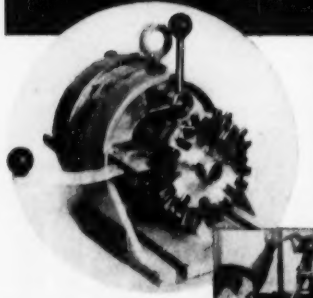
NEW Speed Convenience J&B Table Type SUPER-VERSATILE INDEXING TRUNNION





Newly developed STATION SELECTOR now standard equipment on all J&B Table Type Indexing Trunnions. Can also be applied to trunnions already in field. Operator is relieved of responsibility of correctly selecting desired indexing positions. A predetermined pattern of indexing can be set up whereby any or all of the 24 indexing positions can be blocked out.

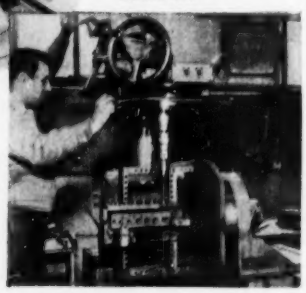


Illustration of a perfect example of the advantages of the J&B Table Type Indexing Trunnion over conventional methods. Notice simplicity of drill jig for drilling all four sides of hydraulic system manifold. Total of 18 holes drilled, 2 holes counterbored, 16 holes tapped in one setup. No need to use air hose. Production greatly increased by faster floor to floor time, rapid indexing, less operator fatigue.

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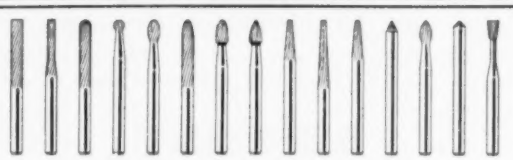

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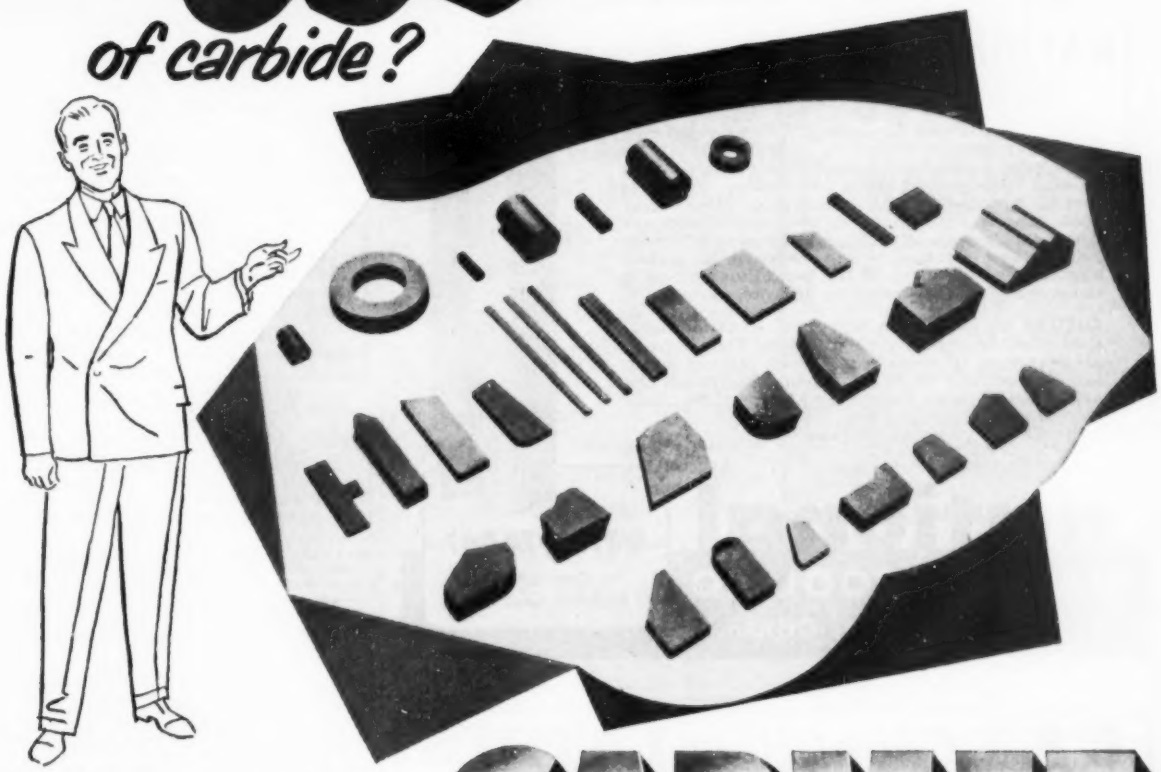

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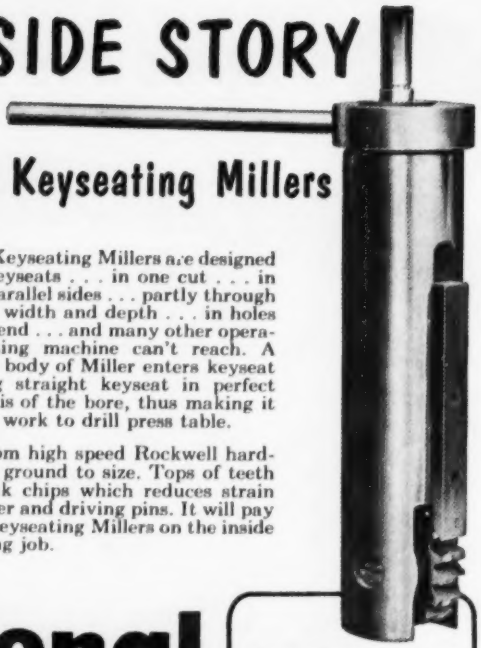

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American Machinist published Bi-weekly with an add'l issue in mid-November at New York, N. Y., for Oct. 1, 1953.

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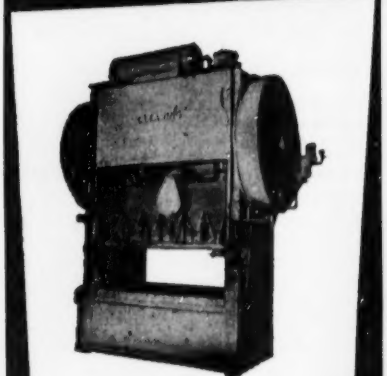

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DRILL, Foadick 16", B.S. Power Feed, M.D.
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DRILL, #121 Baker Auto. S.S. Cam Operated.
DRILL, Deep Hole, Avey-Draulic #2 M.D.
DRILL, Edlund #2B, 3 spdle. #2 M.T., 16".
DRILL, 6 Sp. Avey 12" overhang, #3 M.T., M.D.
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DRILL, Natco Multiple Spdle #12, #1 M.T., M.D.
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DRILL, Barnes, 24" S.S. #4 M.T., 1¾" cap.
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DRILLS, #14, #15, #16, #18 Buffalo Forge, M.D.
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FILER, #11-S Cochrane Bly Auto Saw Filer.
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GRINDER, #1 Wilmarth Morman Hand Surf., 6"x12".
GRINDER, #2 Imperial Univ. Tool & Cutter, New.
GRINDER, #2 Brown & Sharpe Sur. 6"x18" cap.
GRINDER, #2 Cinci. Centerless Filmatic, Late Type.
GRINDER, #4 G & L Univ. Tool & Cutter, M.D.
GRINDER, MATTISON 12"x36" Hyd. Surface, Late.
GRINDER, Disc. Besly #205, 18" Dble End.
GRINDER, Heald Rotary #25, M.D. 16" Cap.
GRINDER, Cylindrical, Norton 10"x24", M.D.
GRINDER, Brown & Sharpe #4 Univ. 12"x60".
GRINDER, Thread, Jones & Lamson #TG-615, Late.
GRINDER, Heald #72A-3 Internal Size-Matic.
GRINDER, 14"x36" Pratt & Whitney Vert. Sur.
GRINDER, Pratt & Whitney 22"x84" Vert. Surface.
GRINDER, Greenfield #12 Int. Hydromatic, M.D.
GRINDER, Oliver Auto. M.D. Drillpointer, #51.
GRINDER, #33 Abrasive Vert. Auto. Surface, M.D.
GRINDER, #22 Heald Horiz. Rotary Surface, M.D.
GRINDER, Diamond Snagging 10 HP, 24"x4¼".
GRINDER, Norton 6x18 Vert. Surface, Hyd. Late.
GRINDER, #60 & #70 Heald Internal.
GRINDER, Landis 6"x18" Hyd. Cyl. late type, M.D.
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GRINDER, 37" Wheel Dia. Osterheim Disc. 24" cap.
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GRINDER, #79, 72" Gardner Vert. Spindle. Late.
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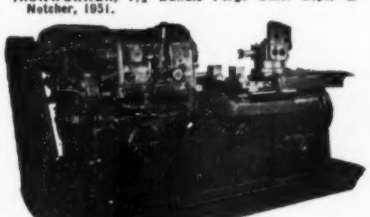

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ELECTRIC HOISTS, 500-4000 lbs. Whiting, NEW.
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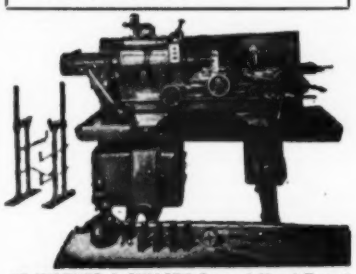
KEYSEATER, #5 Mitts & Merrill, Giant, M.D.
LAPPER, 2F Norton Vert., M.D., late type.

No. 7 BARDONS & OLIVER Geared Head
Full Universal Turret Lathe, Presselector Head. Bar Feed 2½" cap. 4" capacity through spindle. Late Type, Motor Driven.



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LATHE, Hendey 14"x8' Q.C.G. Taper Attach, M.D.
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LATHE, South Bend 18/28"x8' Gap Bed, Q.C.G. M.D.
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LATHE, 24"x10' Axelson Grd., Late, M.D.
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LATHE, Putnam 23/32"x12' Q.C.G., M.D.
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LATHE, Turret #2 W & S Univ. Grd. Hd., Late.
LATHE, Turret, #4 Warner & Swasey Univ. 1½".
LATHE, Turret #6 Warner & Swasey Grd. Hd. Ram Type, Bar Feed, Motor in base.
LATHE, Turret #2 Cinci. Acme Univ. Geared Head.
LATHE, Turret #3A Warner & Swasey Univ. M.D.
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MILL, No. 1½, Milwaukee Plain Horiz.
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MILL, #0-8 Cinc. Vert. Prod. Rotary Table.
MILL, 2M Cincinnati Univ. Horiz. M.D.
MILL, #3B Brown & Sharpe Vertical, M.D.
MILL, #3VB Hardinge Vert. Bench, M.D.
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MILL, #14 Garvin Plain Horiz., M.D.
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MILL, #1 Brown & Sharpe Plain Horiz., M.D.
MILL, #0-8 Cinci. Vert. Prod. Late, M.D.
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MILL, No. 0 Brown & Sharpe Plain Horiz.
MILL, #0 Douglas Plain Horiz. M.D., Coolant.
MILL, #0 Sundstrand Rigidmil Hyd., Late Type.
MILL, #0 Vernon Hand Mill, M.D., Late.
MILL #0-8 Cinc. Horiz. Rise & Fall, Late.
MILL, 2A Brown & Sharpe Horiz. Univ., M.D.
MILLING MACHINE, Kempsmith #2 Horiz. Univ.
MILL, #3 Cinc. Univ. Horiz., M.D.
MILLING MACHINE, LeBlond #4 Horiz. Univ.
MILL, #2 Vert. M.D. Brown & Sharpe.
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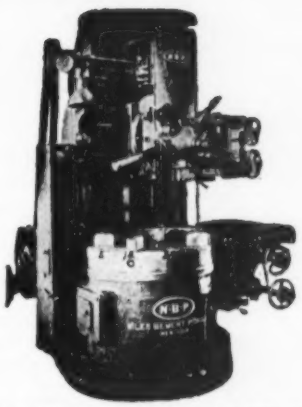
MOTOR GENERATOR SET, Gen. Electric, 100 K.W.
NIBBLER, #136 Savage 36"x3/16" Cap., M.D.
NAILING MACHINE, No. 16—45°-54° Morgan, Late

THREADING, Staybolt Lassiter Millholland 1½".
THREAD MILL, 7½x11 Hanson-Whitney, Univ.
THREAD MILL, 6x14 Pratt & Whitney No. 1105.
THREAD MILLER, Plan-O-Mill #3 Planetary Form & Thread Semi-Automatic Milling Machine, Late.



36" x 44" Niels Vertical Boring Mill, Side Head, Motor Driven.

#40A Lees-Bradner Automatic Chucking Thread Mill. Motor Driven, Late Type.

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PLANER, Cincinnati 30"x30"x12' A.C., M.D.
POWER PRESS, Bliss #164 Open Back, M.D.
POWER PRESS, Bliss #3A S.S. Dble. Crank Grd. 45 tons, 4" stroke, 36"x26" Bed Area, M.D.
POWER PRESS—Bliss-Consolidated #163-B Straight Side Dble. Crank 45 tons, M.D.
PRESS, D72 & DG73 Ferracute, Redraw, M.D.
PRESS, #2½ & #6 Toledo, OBI, Motor Driven.
PRESS, #5 Johnson OBI, 56 tons, new
PRESS, #7 & #8 Johnson OBI 79 & 90 tons, New.
PRESS, 70H & 125PA Drake Hyd. Arbor, New.
PRESS, Federal #2 O.B.I. Grd. 2" Stro.
PRESS, Bliss #18, #19, #20, #21, OBI, A.C., M.D.
PRESS, Waterbury-Farrel High Speed 60 tons #3W.
PRESS, 60 C Bliss Double Action, 3 crank.
PRESS, Lucas 15 tons Power Arbor, M.D.
PRESS, #68 Whitney Deep Thr. 24", foot.
PRESS, P2, P3 Ferracute M.D. Roll feed.
WHEEL PRESS, 600 ton Niles-Bement-Pond, A.C.
PANTOGRAPH, #1A Gorton M.D. Engraving.
PUNCH, #46 Buffalo Forge Vert. Cap. 1"x1½" M.D.
PUNCH, R-4 Wiedemann Turret, 10 Stat. 24" thr.
PUNCH, Hasker Turret, 8 station, cap. 2½" hole.
PUNCH, H & J #2 Sgle. End. 24" Thr. 1" thru 1".

RIVET SETTER, #140 Chicago M.D., ¼" cap. Hopper Fd.
ROLLS, Bertsch Pyramid 18'x1¾" cap., M.D., Late.
ROLLS, #1 Buffalo Forge Wrapping, M.D.
ROLLS, 72"x¼" Lown Initial M.D., New.

COLD SAW, Wagner 10"x10" cap., M.D.
COLD SAW, Espen-Lucas #706, 48" dia. blade, M.D.
CUT-OFF SAW, Radius "J" DeSanno.
CUT-OFF SAW, Yates-American #M-90, M.D.
SAW, #8 Marvel Bandsaw, 10"x10" cap.
SAW, #4B Marvel Hack Saw 6"x6" Cap., M.D.
SAW, #20-C Racine Shear Cut 6"x6" cap., M.D.
SAW, 10"x10" Racine Hyd., Late Type, M.D. #30C.
SAW, Band Tannewitz GH-36" High Speed, M.D.
SAW V-26 DoALL Bandsaw, Late.
SHAPER, 16" Pratt & Whitney Crank, M.D.
SHAPER, 20" Rockford Univ. M.D., Tilting Table.
SHAPER, G & E 24", high duty, back geared, M.D.
SHAPER, 32" Cinci., B.G., Motor Driven, H.D.
SHAPER, Morton, 36" Draw-Cut, 4 speed M.D.
SHEAR, 6' x 14 ga. Parker M.D., Late Type.
SHEAR, #20 Buffalo Forge Slitting Armor Plate.
SHEAR, Quickwork #11 Rotary 60" Throat, 10 ga.
SCREW SLOTTER, #2 Waterbury Farrel Auto.
SLOTTER, 12" New Haven Vertical M.D.
SPOTTER & SCRAPER, Anderson Power Unit, Late.
SPRU CUTTER, Milwaukee 56 tons, 2½ cap., M.D.
SURFACE PLATES & TABLES, all sizes.
TAPPER, #1 Cam Hankins, Motor Driven, Late.
TAPPER, #1 Bakewell (Warner & Swasey) Late.
THREAD ROLLER, #20, #30 Waterbury Farrel.
TRUCK, 2000 lbs. Hyster Fork Lift 9' Model QT-20.
TRUCK, 4000 lbs. LT-44 Towmotor Fork, Lift 9'.
BRINELL TESTER, Type 03DR, Steel City.
WELDER, 500 amp. Westinghouse Flexors A.C.
WELDER, 200 & 400 amps. Gen. Elec. Portable Arc.
WELDER, 75 KVA Federal M.D., Spot.
WIRE STITCHER, Morrison & Acme, M.D.

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UNUSUAL BUYS WITH GUARANTEED PERFORMANCE

PARTIAL LIST OF LATHES

American 30"x12', 3 SCD, 6' centers.
American 35"x14' G.H., 12 spindle speeds.
American 16"x8' bed, 3 SCD, bowl head.
American 38"x10' bed Geared Head, 12 spindle speeds, 2-9/16" hole in spindle, vee belt drive.
Boye & Emmes 20"x10', G.H., complete with taper attachment.
Greaves Klusman 22"x8' G.H. Lathe, complete with taper attachment.
Hendey 20"x10' bed Gearel Head, 8 spindle speeds, 1½" hole in spindle.
LeBlond 17"x8' bed 5 SCD.
LeBlond 27"x10', 3 SCD Lathe, 3'11" centers.
LeBlond 25/50 x 6/10 Sliding Bed Gap Lathe, G.H., Timken bearing.
Lodge & Shipley 14"x5' G.H., single pulley drive. 12 spindle speeds, 28" centers.
Lodge & Shipley 16"x120" centers G.H., Timken bearing, drop lever handles in apron, late type.
Lodge & Shipley 18"x54" centers, 24 speeds, Timken bearing.
Lodge & Shipley 30" x 12' bed G.H., 12 spindle speeds, 62" centers.
Pittsburgh 32"x23' centers Geared head lathe, Timken bearing new 1943.

TURRET LATHES

Acme #2 Full Universal, single pulley drive, hole thru spindle 3½".
Gisholt 1-L Saddle Type Turret Lathe, with bar feed, late type.
Oster 601 Rapidustion.
Libby 3H Turret Lathe, 8" hole in spindle, new 1943.
Potter & Johnston 6 DRE Automatic Chucker.

BORING MILLS—Vertical

Betts 100", two heads on rail.
Bullard 42", AC motor drive.
Niles 36"-44", 1 rail and 1 side head.
Niles 42"x50" Driving Box Borer, Burnisher and Facer, motor driven, late type.
42-50 Niles Vertical Boring Mill, one rail and one side head, late.

GEAR MACHINERY

Barber Colman HRS Combination Sharpener.
Fellows 612 Spur Gear Shaper.
Fellows 725 Gear Shaper, with spur guide.
Gould & Eberhardt 18-H Hobber.
Gould & Eberhardt 36 Hobber.
Gould & Eberhardt 90H Gear Hobber.
Gould & Eberhardt 60BM Gear Rougher.

GRINDERS—Cutter & Tool

Oliver 510 Drill Grinder, new 1942.
Oliver Template Tool Bit Grinder, late.
Sellers 4T Tool Grinder, late type.
Sellers 6T Tool Grinder, late type.

GRINDERS—Internal

Heald 72A3 Plain Internal Grinder, late type.
Heald #78 Centerless Internal Grinder
Micro Internal Grinder, Model F.G.

GRINDERS—Cylindrical

Landis 26"x168" centers Plain, arranged for motor drive with motors, 10 speeds 3 to 62.
Landis #2 Universal, 12"x35" centers, belt drive

GRINDERS—Thread

Jones & Lamson 8x31, late type.

MILLERS—Auto. or Prod.

Hall Style "D" Planetary Mill, late type.
U. S. Multi-Miller, Model 1-5-2, late type.

MILLERS—Plain

Brown & Sharpe #3, 4 SCD.
Cincinnati #3 Hi-Power, single pulley drive.
Cincinnati #4, single pulley drive.
Douglas #8, rectangular overarm.
Milwaukee 2 HL Plain Mill, late type.

MILLERS—Universal

Brown & Sharpe 3A, motor in base.
Van Norman #2 SU, late type, working surface of table 12x50; dividing head.

DRILLS—Radial

American 5'14" column, Triple Purpose.
Fosdick 6'15", Heavy Duty Radial Drill.

PLANERS

Pond 48x48x16' Double Housing, DC drive, 4 heads.

ROLLS

Niles 12'x¾" Initial Type Bending Roll, motor driven with 40 HP motor.

SHAPERS

Averbeck 21" B.G., 4 SCD.
Columbia 28" B.G., gear box drive.
Gould & Eberhardt 20", B.G., gear box.
Gould & Eberhardt 24" B.G., gear box.
Gould & Eberhardt 28" B.G., gear box.
Gould & Eberhardt 32" B.G., gear box.
Potter & Johnston 24" Universal.
Smith & Mills 25" B.G., 4 SCD.

BOREMATIC

Heald #42, late type.

MISCELLANEOUS MACHINERY

H&G Model I-K Threading Machine, late.
Hobart 200 Amp Arc Welder, late type.
Hoffman Heavy Duty Portable Cleaner.
Speedare 150 Amp Welder, late type.
Taft Pierce Bench Center, 8"x48" centers.

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ROLL FORMING MACHINES

Kan & Roach 15 stand, 30" wide, 4½" dia. shaft 75 H.P. M.D.
Yoder 14" stand, 24" wide, 2½" dia. shaft, 25 H.P. M.D.
Tishkin M-2 Ton stand Yoder with AC-2 Cutoff.
Rafter Tube Forming Machines, 5 & 7 Stand.
Yoder 5 stand vertical, with AC-1 Cutoff.

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PRESSES

No. 85 Bliss S.S.S.C. Tie rod frame, 8" str., M.D.

No. 55 Bliss Consolidated S.S.S.C., equipped with side shear, 4" str., M.D.

50-ton Henry & Wright, equipped with double roll feeds and scrap cutter, 2" str., M.D.

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BORING MILLS—Vertical

BULLARD 24" spiral drive; M.D., late type
NILES 53" 2-swivel heads, P.R.T., M.D.
NILES 100" 2-swivel heads, P.R.T., M.D.

BRAKES and SHEARS

BESCO 60" 16-gauge Press Brake; NEW
BESCO 36" 20-gauge Power Squaring Shear; NEW
BESCO 48" 14-gauge Power Squaring Shear; NEW
BESCO 72" 14-gauge Power Squaring Shear; NEW
BESCO 96" x ⅛" Power Squaring Shear; NEW
CHAMBERSBURG 500 HP Billet Breaker; late
NIAGARA No. 160 60" x 18-gauge; late type
QUICKWORK No. 5 Rotary Shear, ⅝" cap. M.D.
QUICKWORK No. 6 Rotary Shear, 1" cap. M.D.
WORMSER T-15 Ironworker; NEW
WORMSER T-25 Ironworker; NEW
WORMSER T-30 Ironworker; NEW

BROACHES

CINCINNATI I-30 Duplex Vertical, Hydraulic; late
COLONIAL VG-1-10-48 Vertical, Hydraulic; late
GILGEAR 3XA Horizontal, Hydraulic; late

DRILLS, Miscellaneous

ALLEN No. 3, 4-sp., 4 motor dr., No. 4 M.T., late
BARNES No. 420 Deep hole; late
BARNES H2 Hydram, cap. 2", No. 5 M.T., hyd., late
BARNES 20", 4-spindle Camel Back, No. 4 M.T., power feed, late type
CINCINNATI 21" round column, M.D. late
LELAND & GIFFORD No. 1 LMS; late
MOLINE 6-sp. Mult. Hole-Hog; 3¾" dia. M.D.
NATCO No. 14 Mult. Rect. Head; PRT; M.D.

RADIAL DRILLS

AMERICAN 5' arm 13" column, Universal, M.D.
AMERICAN 4' arm 11" col. "Hole Wizard" with BULLARD 30"x20" Man-au-trol Spacer table; latest
CINCINNATI BICKFORD 6' arm 15" col. M.D.
KITCHEN & WADE 4' arm 12" column, M.D.

GRINDERS, Internal

BRYANT, No. 3 and 5 Internal; hydraulic; late
BRYANT No. 16-C-16 Internal; hydraulic; late
BRYANT No. 24 Internal; hydraulic; late
CHURCHILL No. 3 Internal; 8" stroke; late
HEALD No. 70A Internal, M.D., late
HEALD No. 81 pl. chuck type, Internal; M.D.
HEALD No. 72A3 and 72A5 Plain Internal; late type
HEALD No. 72A5 "Gagematic" Internal; late
HEALD No. 78 Internal, centerless, M.D.

GRINDERS, Cylindrical, Plain & Universal

BROWN & SHARPE No. 3 Universal; late type
BROWN & SHARPE No. 5, 3"x12"; Plain; late
LANDIS 10"x18" type "C" Plain; hydraulic; late
LANDIS 16"x36" Pl. Cyl. type "D", Hyd.; late
NORTON 10"x48" type "C" Hyd.; Pl. Cyl.; late
LEMPCO 22"x72" Model KG Crankshaft; late
VAN NORMAN No. 666, 48" ctrs. crankshaft; late

GRINDERS, Surface

ABRASIVE No. 34, 8"x24" table; late type
ARTER 8" Rotary, motor drive
BILLITER & KLUNZ 48"x196" Way, Gdr. M.D.
HEALD No. 22 Rotary, 12" chuck; M.D., late
NORTON 6"x18" Vertical Spindle; late type
PRATT & WHITNEY 14"x36" Model "B"; late

MILLING MACHINES—Thread

HALL Style D Planetary; late
LEES BRADNER model HT, 12"x36" centers, late
MOREY 12"x30" centers, late type

MILLING MACHINES—Plain

CINCINNATI I-18 Automatic; Timken; late type
KEARNEY & TRECKER Mod. 2HL, M.D., late
KEARNEY & TRECKER 4H Plain, Timken, late
ROCKFORD #3 Rigid Mill, motor drive.
STARR #2 table 13"x55", late type.

MILLING MACHINES—Universal

CINCINNATI #3 dial type, timken, M.D. late
RICHMOND #2 light type, late

MILLING MACHINES—Vertical

CINCINNATI 0-8 vertical; timken; late type
KEARNEY & TRECKER 3H Vert., timken, late
KEARNEY & TRECKER 3K, H.S., timken; late

PLANERS

BETTS (Consolidated) 103"x84"x44"; 4 hds; PRT; box table; M.D.
DETRICK & HARVEY 48"x48"x16', 4 hds hydr., M.D.
GRAY 24"x24"x6'; motor drive
GRAY 36"x36"x10' double housing "Maximum Service," M.D.
LIBERTY 144"x76"x48' adj. variable openside, box table, 4 hds. PRT, M.D.
NILES 48"x48"x12' "Time Saver", 3 hds, late.
NILES 106"x84"x42' 4 hds, rapid traverse, box table, DC, M.D.
N.B.P. 72"x72"x30'; 4 hds; P.R.T. M.D.
NILES 48"x48"x10' double 4 hds; PRT; M.D.

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VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

CENTERING MACHINES

SWEDISH: Double-End, 42" & 60", new
SUNDSTRAND: Double-End, #53, 24" Centers.

CUTTER & TOOL GRINDERS

FELLOWS: Flat Top Helical Gear Cutter Grinder
OLIVER: 10" Template Tool Bit
RANSOM: 2-Wheel Grinder 3 HP
RUSSELL: 40" Saw Sharpener (New) automatic indexing

DRILLING MACHINES

ALLEN: No. 2 Drill—6 Spindle
ALLEN: #2 High Speed 15" overhang
PRATT & WHITNEY: ½B x 50 Deep Hole Drilling & Reaming Machine, 2-spindle
RADIAL DRILLS: Archdale, 5', 6' and 7', new

GEAR CUTTING MACHINES

CLEVELAND: Model 130 Gear Hobber (like new)
CLEVELAND: Model 140 Gear Hobber (like new)
FELLOWS: 64A Shaper, 18" dia.
FELLOWS: 72 Shaper, 7" dia.
FELLOWS: Flat Top Helical Gear Cutter Grinder
FELLOWS: Straight Line Generator, 3" dia. with many cutters
GLEASON: #12 Rough & Finish Gen.
GLEASON: 3" Straight Bevel Geear
SYKES: Gear Shaper 14" external, 20" internal (New)
SYKES: Rack Cutting Machine 12" to 36" length capacity (New)

GEAR AND SPLINE GRINDERS

PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
GEAR GRIND MACH: GG-19, 10" x 24" Hydr. Spur Gears and Splines
INTERNAL GEAR GRINDER, GG-31

GEAR FINISHERS & TESTERS

FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical
FELLOWS: #12C Cone & Spacing Inspection Instrument
GLEASON: No. 3 Bevel Gear Tester
GLEASON: No. 4 and No. 6 Bevel Gear Testers. Hand and Power
NATIONAL BROACH: SIC-12" Red Ring Gear Testing Machine

GRINDERS—CYLINDRICAL

BROWN & SHARPE: No. 10 capacity 6"x18" plain
CINCINNATI, 6"x18" Hydraulic, Plain
LANDIS: 16x32" Type "D" Crankpin, hydraulic, for grinding crankshafts
NORTON: 10"x18" 45° angle wheel

3-WAY GUARANTEE

1. Should any machinery purchased from us prove unsatisfactory, you can return the machines within 30 days, via freight prepaid to our plant, and a full refund will be made.
2. Machines at our plant can be demonstrated and tested under power before purchasing.
3. You are dealing with a well-established, highly-rated firm of machinery engineers with over 33 years of proven responsibility.

GRINDERS—GEAR & SPLINE

GEAR GRIND MACH.: GG-19, 10"x 24" Hydr. Spur Gears and Splines
PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
INTERNAL GEAR GRINDER, GG-31

GRINDERS—INTERNAL

BRYANT: 16-16 Internal Hydraulic
BRYANT: No. 5Y Internal
HEALD: 72A3 Sizematic Centerless

GRINDERS—RADIUS

VAN NORMAN: #73, capacity 7½"
VAN NORMAN: #649, capacity 6" to 16" diameter
VAN NORMAN: #3½ Un. Radius

GRINDERS—SURFACE

THOMPSON: Hydr. Surface Grinder, 10 x 18 x 24" New

GRINDERS—THREAD

EXCELLO: #31 External, dia. 5"x18"
JONES & LAMSON: #636 Universal, 6" dia. x 36" centers and one extra multiform wheel dressing attachment

HONING MACHINES

MICROMATIC: H-510 Double End Horizontal, ¾" to 2" dia.
MICROMATIC: H-2 Single End Horizontal, 2 spindle, ¼" to 1" dia.

LAPPING MACHINES

FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical

LATHES PRODUCTION

BLOUNT: Polishing speed lathe 12" dia. x 48" centers
H.E.B.: High production hydraulic duplicating and copying lathes (new)
LODGE & SHIPLEY: #3A Duomatic, 25½" swing x 27" centers
TRIPLEX Tool Room Lathe, 14"x60", new

LATHES—TURRET

WARNER & SWASEY: 1A & 3A
WARNER & SWASEY #3 & #5
HERBERT: #0, #2, #4, #7, #8 and #9B/30 Sizes, new
WEBSTER & BENNETT: Vertical Turret Lathes 36" & 48" (New)

MILLING MACHINES

TAYLOR-FENN: M-80 Duplex Spline
RICE-BARTON: 4" Twin Spline
VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

SAWS & CUT-OFF MACHINES

MOTCH & MERRYWEATHER: No. 3 Circular Saw with auto. stock feed
RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
RUSSELL: 5½" dia. cut-off saws, auto stock feed, hydraulic (New)

THREAD MILLERS & TAPPERS

HALL PLANETARY: Model "D" Thread Miller
LANDIS: 2½" single head horiz. threading machine
LEES-BRADNER: #40A Thread Miller
LEES-BRADNER: CT-36 Thread Miller chucking type, 13½" hole.
MURCHEY: #22 Horizontal threading and tapping machine, ½" to 2½" dia. capacity, single spindle
NATCO: Vertical Tapper 16 spindle

WIRE FORMING MACHINES

BAIRD: 4-slide wire former
HEENAN & FROUDE: Wire forming, 4-slide machines (new)

MISCELLANEOUS

ARTER CARBIDE Tool Grinders
OPTICAL PROFILE GRINDER, Wickman, New
OPTICAL PROFILE GRINDER, Sheffield, used.
AUTOMATIC SCREW MACHINE, Swiss type, ⅜"—used
AUTOMATIC SCREW MACHINE Wickman, Single Spindle, 7/16", New
RACK CUTTING MACHINE: Sykes 12" to 36" length capacity (New)
CUT-OFF: Russell 5½ & 9½" cut-off saws with auto. stock feed (new) hydraulic
TEST STAND: Denison 918-AM Hyd.
LATHES: Blount Polishing Speed Lathe 12" dia. x 48" centers
HARDNESS TESTER: Gogan Brinell, Model 16-8
SHEFFIELD Precisionaire Gauge
SWEDISH, Double-End, 42" & 60", new
SUNDSTRAND: Double-End, #53, 24" Centers.
WIRE FORMING MACHINES: 4-slides (new)

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MILLING MACHINES

No. 3-B Brown & Sharpe Heavy Plain, a.c. m.d.
No. 4-B Heavy Brown & Sharpe Plain, a.c. m.d.
No. 4 Cincinnati "High Power" Universal, a.c. m.d.
No. 4 Cincinnati "High Power" Vertical, a.c. m.d.
No. 36 Van Norman Ram Type, div. hds., a.c. m.d., 1943
No. 1-14 Kent-Owens Hydraulic, a.c. m.d., 1940

LATHES

36"x120" ctrs American 12-speed Grd. Hd., a.c. m.d., taper
36"x96" ctrs Schumacher & Boye Triple Geared, cone, taper
22"x72" ctrs Lodge & Shipley 12-speed Selec Grd Hd., a.c. m.d., taper
19"x48" ctrs LeBlond H.D. 12-speed, a.c. m.d., taper

PLANERS

42"x42"x14' Niles-Bement-Pond Heavy Pattern, d.c. reversing drive, four heads, box table
42"x42"x16' Gray, arranged m.d., two heads

RADIAL DRILLS

5'-13" col. Dreses, cone drive
6'-16" col. Dreses Full Universal, a.c. m.d.
7'-17" col. Dreses, a.c. m.d.

GRINDERS

Model A-1-8 Arter Rotary Surface, a.c. m.d., new 1943
No. 49—53" Besly Vertical Spindle Disc, motor on spindle
10"x24" Landis Plain self-contained, a.c. m.d.
10"x48" Type C Landis Plain Hycraulic, hydraulic in-feed, plunge cut, reciprocating wheel spindle, new 1941

GEAR MACHINERY

No. 3—26" Brown & Sharpe Gear Cutter, a.c. m.d.
No. 5-A Cincinnati Gear Cutter, a.c. m.d., capt. 60"x16"
No. 18-H Gould & Eberhardt Hobber, a.c. m.d.
No. 7 Fellows High Speed Shaper, s.p.d.

MISCELLANEOUS

No. 2L Gisholt Turret Lathe, a.c. m.d., Timken, hard ways
No. 12-B Pratt & Whitney Single Spindle Profiler, a.c. m.d., 1943
1¼" Cone 4-spindle Automatic, a.c. m.d., bar feed
24" Bullard "New Era" Vertical Turret Lathe, arr. m.d., threading
Style B Long & Alstatter Double End Angle Shear, capt. 6"x6"x1"
No. 3 Cleveland Bar Shear, capt. 2½" round

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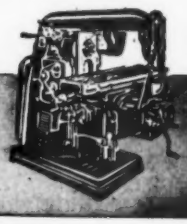

5 MINUTES FROM THE CINCINNATI HOTEL DISTRICT

P. O. BOX 1953 CINCINNATI 1; OHIO
Office&Warehouse 311-313 Bakewell St.,Covington,Ky.

LATE MODEL MACHINE TOOLS . .

AUTOMATICS

2" Model A Cleveland, 1941.
1-1/16" Model A Cleveland, 1943.
No. 00G Brown & Sharpe, 1941.
No. 0G Brown & Sharpe 1941

BROACHES

HP-100 La Pointe Horiz. Broach. 1944

DRILLS

J-125-U Kaukauna Univ. Radial. 1947.

GEAR EQUIPMENT

No. 7 Gleason "Revex" Rougher. 1943.
No. 0 Gleason Revacycle Generator. 1940.
No. 72 Fellows H.S. Gear Shaper. 1942.
No. 5I Fellows Gear Shaper. 1942.
10" Pratt & Whitney Hyd. Gear Grinder. '42
BG-11 Georgrind Spline Grinder. 1942.

GRINDERS

10"x18" Norton Plain Type "C". 1940.
6"x30" No. 12 B & B Hydraulic. 1940.
No. 72A-3 Heald Int. Extended Base. 1942.
No. 72-A3 Heald Plain Hydraulic. 1942.
No. 24-36 Bryant Hydraulic. 1943.
No. 16A2B Bryant Hole & Face. 1942.
No. 172 Heald Hydraulic, Gap. 1940.
A3—10" Arter Rotary 1943
No. 24D Hanchett Duplex Rotary. 1945.
No. 16A Blanchard Auto. Surface. 1942.
No. 2 Cincinnati Centerless Grinder. New 1944.
Cincinnati Centerless Lapper. 1942.
HRB Barber-Colman. 1942.
No. 3S Excello Precision Thread. 1942.
No. 7 Grand Rapids Universal. 1942.
No. 1 Brown & Sharpe Univ. 1940.

GUN BARREL MACHINES

No. ½ B x 30 P & W Reamer. Latest.
No. ½ B x 30 P & W Reamer. Latest.
No. ½ B x 30 P & W Rifler. Latest.

LATHES, ENGINE

27"x192" Niles Timesaver. 2 Carr. 1941.
27"x96" Niles Timesaver. 1940.
24"x180" Betts Bridgeford. 1940.
18"x72" Cincinnati. 1947

LATHES, PRODUCTION

9"x84" Lo-Swing Semi-automatic. 1941
No. 3A Lodge & Shipley Duomatic. 1942
No. 1FU Foster Fastermatic. 1942

LATHES, TURRET

36" Bullard VTL, Spiral Drive. Late.
No. 1L Gisholt Saddle Type. Late.
1A Warner & Swasey Saddle type. 1941
No. 2A Warner & Swasey Saddle Type. 1940.
No. 3R Gisholt Universal Saddle Type. 1943.
No. H5 Libby Universal Saddle Type. 1939.
No. 5 Gisholt Universal Ram Type. 1942.
No. 4 Gisholt Universal Ram Type. 1940.
No. 2M-50 Warner & Swasey Ram Type. 1941.

MILLS, BORING

No. 4I Lucas Horiz. 1941.

MILLS, PRODUCTION

No. 1-18 Cincinnati, 1942.
M-18 Milwaukee. 1943.
No. 0B CINCINNATI Rise and Fall. 1942
8x16 Hanson-Whitney Thread. 1939.

MILLS, TOOL ROOM

No. 3 Cincinnati Univ. Dial Type.
No. 2 Salmp Vertical New.
No. 2 Salmp Universal. New.
No. 3 Salmp Plain & Vertical. New
No. 4 Salmp Vertical. New.

PRESSES

Verson 650 Ton Double Action. 1948.
No. 168½ Toledo Toggle.
No. 166 Toledo Toggle.
No. 67 Bliss Consolidated Press

SHAPERS

32" Ohio Heavy Duty Univ. 1951.
16", 20", 24" Gernetti Universal Shaper. New.

Partial Listing — Write for latest stock list

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"LOOK THESE OVER"

4½" ACME GRIDLEY Single Spindle Model L Automatic
3'11" DRESES Radial Drill—Motor on arm
12x30" and 16x8' MONARCH Geared Head Lathes
30"x16' bed AMERICAN High Duty Geared Head Lathe
42"x15' AMERICAN Heavy Duty Lathe
42"x25' centers AMERICAN Heavy Duty Lathe
No. 5A BRYANT Internal Grinder
No. 172 HEALD Gap Internal Grinding Machine for large swing
6"x18" LANDIS Type C Plain Grinder
10"x72" LANDIS Type C Hydraulic Plain Grinder —1942
Nos. 4D & 6S POTTER & JOHNSTON Automatic Lathes
Nos. 8A and 9A JONES & LAMSON Saddle Type Universal Heavy Duty Turret Lathes
No. 26 VAN NORMAN Universal Miller
No. 3 CINCINNATI Dial Type Plain Miller
No. 2 CINCINNATI HS Dial Type Plain Millers
No. 5 CINCINNATI Plain High Power Miller
No. 0-8 CINCINNATI Plain Milling Machines
No. 2M CINCINNATI Vertical Miller, 1941
No. 1-18 CINCINNATI Plain Mfg. Miller
No. 12 B&S Plain Bed Type Production Miller
6"x60" P&W Model C Thread Miller
Nos. 64 and 72 FELLOWS High Speed Gear Shapers
No. 12 FELLOWS Gear Shaver 1943
No. 30BM GOULD & EBERHARDT Gear Rougher
16/20" GOULD & EBERHARDT Industrial Shaper
36" OHIO "DREADNAUGHT" H.D. Shaper.
100" BETTS Vertical Boring Mill, 2 heads.
50-ton HENRY & WRIGHT Dieing Machine, 1948.

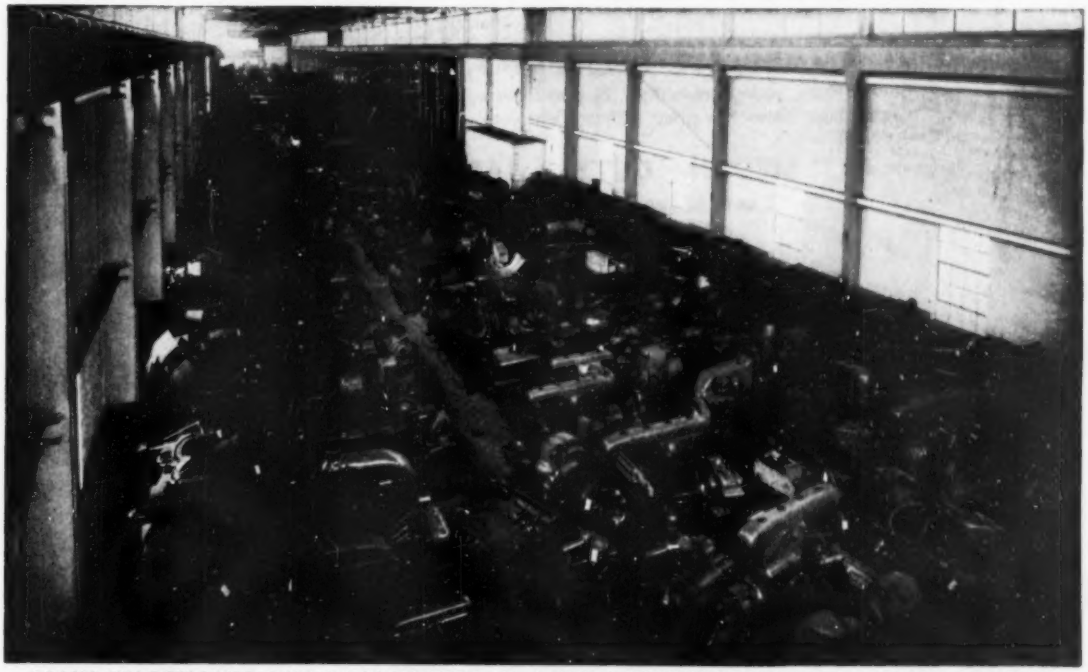
WIGGLESWORTH INDUSTRIAL CORPORATION
203 Bent St., Cambridge 41, Mass.

MICROMATIC HONE Model H-4
Serial No. 134
New in 1944

WINSTON MACHINERY CO., INC.
326 West Ohio St., Indianapolis 2, Ind.

Eastern Rebuilt Machine Tools

THE SIGN OF QUALITY—THE MARK OF DEPENDABILITY



MAIN WAREHOUSE BAY IN EASTERN'S 11 ACRE CINCINNATI PLANT — THE LARGEST MACHINE TOOL PLANT IN THE U.S.A. DEVOTED EXCLUSIVELY TO REBUILT MACHINERY.

RADIAL DRILLS

2½'-10" col. American Triple Purpose Plain, m.d.
3'-13" col. Cincinnati-Bickford Super-Service, m.d.
3½'-10" col. American Triple Purpose, Plain m.d., box table
5'-13" col. American, gear box, m.d.
5'-15" col. American Triple Purpose, m.d. on arm
7'-16" col. American Triple Purpose, m.d.
8'-17" col. Dreses, gear box, m.d.
8'-19" col. Cincinnati-Bickford Super-Service, m.d.
Zeus Precision Universal Bench Type Radials, m.d., new
Baush Radial Drilling & Tapping Machine, m.d.

BALL BEARING DRILLS

No. 15 Buffalo, Floor Model, m.d.
No. 18 Canedy-Otto Bench Model, m.d.
Providence Engineering Co., Model E, s.p.d.
No. ½, 1, 2 Avey, belted m.d.
No. 1B Edlund, m.d., new
No. 2MS Edlund, single spindle, m.d.
No. 4 Fosdick, 8" overhang, belted m.d., No. 2 Taper
1 spindle Allen, belted m.d.
2 spindle Allen, belted m.d., 8" overhang
No. 3 Allen, belted m.d.
2 spindle Avey, size No. 1, type B, style VHP, m.d., 8" overhang
2 spindle Avey, No. 2, 3, belted m.d., p.f.
2 spindle 2'2 Leland & Gifford High Speed, 8" overhang, m.d.
2 ILMS—3 spindle Leland & Gifford High Speed, late, m.d.
3 spindle No. 2 Foote-Burt High Speed, m.d.
3 spindle Leland & Gifford High Speed, Model 3MS, m.d.
4 spindle Avey 21 High Speed, m.d., 7½" overhang, No. 2 M.T.
4 spindle No. 3 Avey, belted m.d., No. 3 Taper, 12" overhang
4 spindle Leland & Gifford, m.d.
6 spindle Leland & Gifford, No. 2 Taper, m.d. on each spindle
6 spindle Henry & Wright, m.d., 15" overhang, No. 2 Taper
6 spindle No. 1 Avey, belted m.d.
No. 4B-12 Edlund, m.d., No. 3 M.T.

HORIZONTAL DRILLS

Natco Horizontal Production Boring Machine, m.d., with D-11-HU heads
3 way Natco Horizontal Drill, consisting of 3 E13 Hole Units
No. 1½Bx30" Pratt & Whitney 2 spindle Deep Hole Reaming Machine, m.d.
No. 1½Bx50" Pratt & Whitney Gun Barrel Rifling Machine, m.d., latest
No. 1Bx74" Pratt & Whitney 2 spindle Deep Hole Reaming Machine, m.d., latest
No. 1½x105" Pratt & Whitney 2 spindle Deep Hole Drill, m.d., latest
No. 1½x105" Pratt & Whitney 2 spindle Gun Barrel Rifling Machine, m.d.
No. 1 Pratt & Whitney 2 spindle Deep Hole Drill, belted m.d.
Special Horiz. Drill Machine, Cinti. Bickford Head mounted horiz. on base

AUTOMATICS

⅞" Cleveland Model B, belt
1½" Cleveland Model A, belt
No. 6C Potter & Johnston, m.d.
14" Fay Flanders Type, m.d.
No. 8A Cleveland, m.d., 8" cap., latest Model B—1-1/16" Cleveland, m.d.

BOLT THREADERS

Victor Nut Facing Machine, m.d., cap. ⅜" to 2" nuts
1" Landis Double Spindle, m.d. thru gear box
1½" Landis 2 spindle, late
1½" Landis 2 spindle, older type
2" Acme Double Head Bolt Threader, m.d.

HORIZONTAL BORING MILLS

Barrett Double End, 5" and 7" spindles, m.d.
5½" bar Niles-Bement-Pond, m.d.
6" bar Newton No. 2 Cylinder Borer, m.d.
10" bar Sellers, Floor Type, m.d.
Pair tables for use on Floor Type Horiz. Boring Mill, 8' long x 15¾" wide x 33" high, 2T slots
54"x11' Rectangular Table, 40" high
Pair tables 32" wide x 18' long x 10½" thick, 2 T slots
32" wide x 18' long x 10½" thick Floor Plates, with 3 Tung Slots
Floor Plate 6'11" wide by 9'1" long by 9¼" thick, 6 T slots

VERTICAL BORING MILLS

42" Bullard Spiral Drive, m.d.
42" Bullard New Era, m.d.
44" Putnam, m.d., p.r.t.
44" Niles, m.d., p.r.t.
48" Colburn, m.d.
48" Niles-Bement-Pond Car Wheel Borer, m.d.
53" Niles Heavy Pattern, m.d., p.r.t.
73" Niles, m.d., p.r.t.
100" Niles Heavy, m.d., p.r.t.
102" Niles Wheel Turning Boring Mill
12' Niles, m.d., p.r.t.
108" Cincinnati Vertical Hypro Vertical Boring Mill

BROACHING MACHINES

75 H.P. LaPointe Hydraulic Broach, m.d.
Cincinnati Mill Broach, m.d., 10" spindles, new
12x72" Thompson Automatic Flat Broach, m.d.

IN ADDITION TO THE ABOVE, WE ALSO HAVE IN STOCK MULTIPLE SPINDLE DRILLS, UPRIGHT DRILLS, GEAR MACHINERY, GRINDERS, HONING MACHINES, ENGINE LATHES, MFG. LATHES, MILLING MACHINES, PIPE MACHINES, PRESSES, PUNCHES & SHEARS, PLANERS, SAWS, RAILROAD MACHINERY, SHAPERS, SLOTTERS, TAPPERS, SHEET METAL MACHINERY, TURRET LATHES, ETC.

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THE EASTERN MACHINERY COMPANY

4[illegible] Avenue, Cincinnati 29, Ohio [illegible] CABLE ADDRESS EMCO

• LATHE CHUCKS •

• COMPARE THESE PRICES •

ACT QUICKLY WHILE OUR STOCK LASTS

BRAND NEW • ABSOLUTELY GUARANTEED

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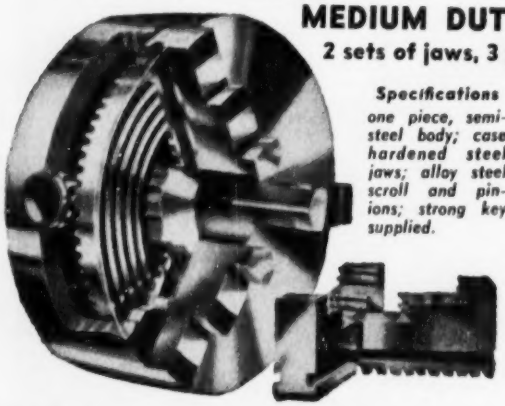
IMMEDIATE DELIVERY FROM STOCK

These lathe chucks, manufactured in England are equivalent in all respects to chucks selling here for two and three times the price. All are absolutely guaranteed with respect to accuracy, workmanship, and strength.



MEDIUM DUTY 3 JAW UNIVERSAL CHUCKS

2 sets of jaws, 3 pinions, for use with intermediate backplate.

Specifications

one piece, semi-steel body; case hardened steel jaws; alloy steel scroll and pinions; strong key supplied.

Size	Weight	Price	Price Soft Jaws
2¾"	2½ lbs.	$ 25.00	$ 5.00
3¼"	3½	26.50	6.50
4"	6½	30.00	7.50
5"	12	37.50	9.00
6"	17½	45.00	10.00
7½"	29	57.50	13.50
9"	42	67.50	15.00
10½"	62	95.00	20.00
12"	88	125.00	22.50
15"	143	175.00	25.00
18"	200	250.00	35.00
24"	324	325.00	45.00

Steel body chucks are also available in some sizes.
Soft jaws and spare parts are immediately available from New York stock.

Send For Latest Catalog • Dealers Inquiries Invited

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with **GUARANTEED PRECISION MACHINE TOOL REBUILDING and MOTORIZING**

A machine doesn't make any money standing idle — whether it is in a large plant or in a small shop!

Manufacturers know how important dependable and accurate machines are to maintain peak performance — to keep a good customer satisfied. They know, too, that old machines rebuilt by expert workmen and engineers can produce in volume and keep costs from going up.

Worcester Automatic Rebuilding Company can rebuild your old machine for long life and accurate operation. Special facilities plus experience assures both excellent workmanship and efficient handling of your equipment.

We take your old machine, strip it down to the bare casting — clean it — replace worn parts and refinish sliding surfaces like new again. All machines are carefully tested and guaranteed.

Let the Worcester Automatic Rebuilding Company be the answer to your Machine Tool Rebuilding and Motorizing problem. We'll gladly help you find out. Simply write to address below.

Precision Machine Tool Rebuilding • Motor Drive Engineering

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WORCESTER AUTOMATIC REBUILDING COMPANY

10′ BETTS

VERTICAL BORING MILL

3 1/8" FOSDICK

HORIZONTAL BORING MILL

108" Spindle to outboard support.

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FOR SALE

Toledo 95D—250 Ton Back Geared Double Crank Press in excellent condition. Bed 36 x 72—6" stroke—15" shut height. Push Button Control, Air Clutch, Air Cushion. Photo Cell Safety.

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Hatboro, Pa.
Ph. Hatboro 1950. Mr. Morris—Mr. DeMaris

FOR SALE

1—Heald Sizematic, completely rebuilt by the Heald Machine Company within the last 90 days, serial No. 6887.

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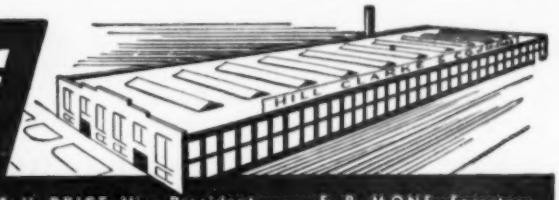
HILL-CLARKE MACHINERY COMPANY



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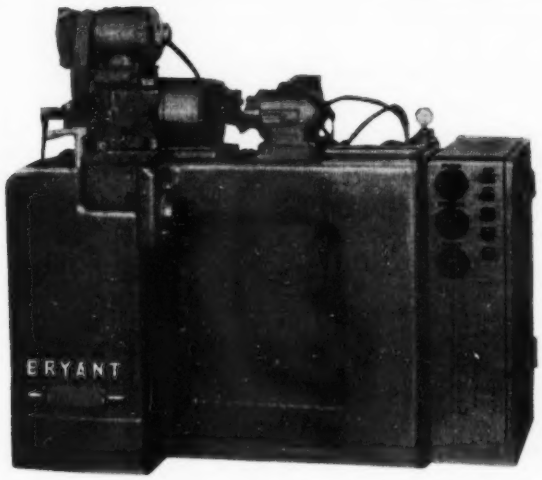

LATE 1951 MACHINE

NO. 1109 BRYANT INTERNAL GRINDER

Beautiful condition, total chuck swing 9 inches. Max. traverse stroke 6", max. grinding length 3½", self-contained electrical equipment with high frequency wheel spindle.

AUTOMATIC

1-1/16" Model A Cleveland (1942)

DRILLS

1 Spdl.—14" Sw.—No. 2 Avey Cam Fd.
1 Spdl.—30" Sw.—No. 4 taper Aurora
2 Spdl.—24" Sw—No. 3 Avey
12 Spdl. D-31 Fox, No. 2 Taper

GEAR MACHINES

No. 12HS Gould & Eberhardt Hobber
11" Gleason Bevel Gear Generator
No. 36-BM G & E 3 Spdl, Rougher
No. 612-A Fellows Gear Shaper
No. 615-A Fellows Gear Shaper
No. 64 Fellows Gear Shaper
No. 65 Fellows
8" cap Red Ring Gear Lapper

GRINDERS

6" x 18" Landis (1942)
6" x 18" Norton Cylindrical (1943)
10" x 36" Norton Type C
10" x 36" Norton Type C Cam. Grdr.
10" x 48" Norton type C (1943)
Hill-Clarke Cylindrical Grinders
10" x 36" centers
10" x 72" centers
10" x 96" centers
14" x 36" centers
14" x 50" centers
14" x 72" centers
14" x 96" centers
18" x 96" centers
18"-30" gap x 96" centers
24" x 264" centers
No. A-3—12" Arter Rotary Surf.
No. 1109 Bryant Internal Grd. (1951)

YOUR WORN MACHINES CAN BE "NEW" AGAIN

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HILL-CLARKE
Gives You the Finest Re-manufacturing Obtainable

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CONSULT US ABOUT REBUILDING YOUR OWN MACHINES

(9" swing — 1" bore x 3½" grind stroke)
No. 5 Bryant Internal Grd.
No. 5B Bryant Internal Grd.
No. 16-16 Bryant Internal Grd.
No. 16-A-16 Bryant Internal Grd.
No. 16-28 Bryant Internal Grd.
No. 16 A-28 Bryant Internal Grd.
No. 16 F-28 Bryant Internal Grd.
No. 24-26 Bryant Internal Grd.
No. 24-36 Bryant Internal Grd.
No. 81 Heald Centerless Internal
No. 74 Heald Internal Centerless

BORING MACHINES

54" Ingersol Vert. Adjustable Rotary Mill
No. 45—4½" bar G & L Hor. Bor.
100" Niles-B-Pond Vert. Bor., Mill

LATHES

16" x 33" R-14 Seneca Falls Auto. Lathe
18" x 6' American Geared Head Lathe
18" x 8' Lodge and Shipley
19" x 8' LeBlond Hvy. Duty Lathe
27" x 12' American Geared Hd. Lathe
27" x 12' centers LeBlond Lathe
36" x 18' Putnam Grd. Hd. M.D.
5W Acme Ram type Tur., 2" Capacity
No. 6 Warner & Swasey Tur.-Bar Fd.
18" Libby Tur. Lathe, M.D.
No. 3AL Gisholt Cross-Slide Tur.
No. 4A Warner & Swasey—7½" Hole Spdl.
No. 4A Warner & Swasey, Taper, (1944)
No. 4A Warner & Swasey, Taper, Cross-Slide (1942)

MILLING MACHINES

No. 08 Cincinnati Vert. Mill (1942)
54" x 30" x 16' Ingersoll Slab Mill
6" x 168" Pratt & Whitney Thrd. Mill
10" x 48" Hanson-Whitney (1942)
10" x 60" Pratt & Whitney Thrd. Mill
12" x 102" Lees-Bradner Thrd. Mill

PLANERS

36" x 36" x 12' Cincinnati, 2 hds.
48" x 36" x 14' Gray, 2 hds.
48" x 48" x 12' Cincinnati, 2 hds.
60" x 48" x 27' American, 4 hds.

MISCELLANEOUS

Model No. 2 Micro. Horiz. Hone
42"—18 gage Economy Power Shear
75 Ton R & K Straight Side Press
3 Ton Fox Hydraulic Press
2—12" x 96" Magnetic Chucks
20' x 1" cap Southwark Roll
15" Dill Slotter
18" Dill Slotter
38" Morton Draw-Cut Shaper (1945)

FULL MONEY-BACK GUARANTEE

1. Hill-Clarke always give you an unconditional money-back guarantee.
2. All machines in stock.
3. You can see your machine run and tested under power in our plant before purchasing.
4. Complete and modern facilities plus experienced craftsmen for REMANUFACTURING machine tools in our 58,000 sq. ft. plant.
5. A responsible organization — established 1867.

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HILL-CLARKE

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651 WASHINGTON BOULEVARD, CHICAGO 6, ILL. PHONE CEntral 6-0500

HERE IS A *PARTIAL* LIST OF MACHINERY IN OUR WAREHOUSE

No. 8 SUNDSTRAND Stub Lathe, 1941
10" MONARCH Lathe, 1940
18x48 MONARCH Lathe, Ser. #16073, 1942
No. 5 WARNER & SWASEY Turret Lathe, 1940, Chucker
4A WARNER & SWASEY Turret Lathe, 12" Hole Cross Sl. Turret Lead Screw, Power Chuck, 1941
No. 30 GIDDINGS & LEWIS Boring Mill 3" Hor. w/2 aux., Ser. #4806
No. 3-36 CINCINNATI Production Mill
No. 2 CINCINNATI Univ. Grinder, T & C, 1943
4H LANDIS Grinder, Plunge, 4x18, 1942
6x30 CINCINNATI Grinder, Plunge Cut, 1943
10x96 NORTON Grinder, Hyd., 1942
Mod. 7125A FELLOWS Gear Shaper, Ser. #19713
2" GREENLEE 6 Spdl. Screw Machine, 1940
Mod. A 3¾" CLEVELAND Screw Machine, Late, 1942
8'9" CINCINNATI BICKFORD Radial Drill, 1941
No. 201¼ BARNES Drill, 1948
BUFFALO Angle & Bar Shear 15" I-Beams, 8"x8"x1¼" Angle, 4" sq. cap., 1944
16A BLANCHARD Grinder, 1944

SEND US YOUR INQUIRIES OR CALL 2-7721

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90% OF BEHR'S CUSTOMERS SAY "*REBUILD* TO SPECIFICATIONS"

YES

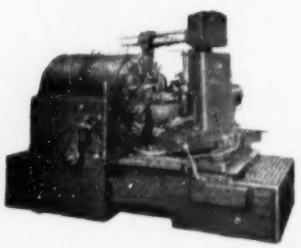
REBUILD to specifications, say 90% of the men who buy machine tools from Joseph Behr & Sons' huge stock. No better pattern can speed your needs. You select the machine you need right from the WAREHOUSE in Rockford and if you so desire, you may have it REBUILT to new tolerances right on the spot. You are invited to come to Rockford and see for yourself.

REBUILDERS • MACHINERY & ELECTRICAL

SINCE 1906 **JOSEPH BEHR & SONS, Inc.** FOR SERVICE

1218 SEMINARY ST. • ROCKFORD, ILL.

LAURENS late models



No. 17 GLEASON Spiral & Hypoid Bevel Gear Grinder; 1944

LISTED BELOW IS A GROUP OF THE MANY FINE MACHINES WE HAVE IN STOCK:

6" x 18" NORTON Semi-Automatic, plunge; oscillating spindle; type "C", rebuilt

14" x 36" NORTON Type "CD" Hydr. Plunge; oscillating spindle; 1940; rebuilt

4" x 12" LANDIS Type "H", Hydraulic Plain Cylindrical Grinder; late; rebuilt

No. 22 HEALD Rotary Surf. Grinders; 12" dia. chuck; vertical power feed

No. 72A-3 HEALD Plain Internal Grinder; late; rebuilt

No. 81 HEALD Sizematic Chucker; late

No. 172 HEALD Gap Type Cross sliding Head Internals; late

No. 73 HEALD Airplane Cylinder Internal Grinder; late

24-L-36 BRYANT Hydraulic Internal Grinder; 1942

12" x 36" Model C NORTON Multipurpose Universal Hydr. Grinder, 1943, rebuilt

Telephone REdwood 3500

Ask for Stock List #953-A

Tool & Machine **LAURENS BROS., INC.** 2781 HIGHLAND AVE. CINCINNATI 12, O.

MACHINERY FOR SALE

Brown and Sharpe Hobber, No. 44, serial No. 104 with Crocker Wheeler Motor, serial No. 748275. Equipped to cut spur and spiral gears and splines.

Schuchardt and Schutte Hobber, 36" CAP TP #2, serial No. 6706. Equipped with differential for cutting spur, spiral, and worm gears.

60" Reinecker Hobber, RF No. 4N, Serial No. 6937/1. Completely rebuilt. Equipped with Tangential feed and differential.

These hobbers now being used in production and in excellent condition. Can be seen in operation.

1—Monarch Lathe 12" and serial No. CK 3919.

1—Monarch Lathe 14", serial No. C-5239.

All of the above equipment motorized, 220 volts AC, 3 phase.

FS-8480, AMERICAN MACHINIST
330 W. 42 St., New York 36, N. Y.

TRUCK CRANE
Elwell Parker
PRACTICALLY NEW
6000# Lift
Electric-Gasoline
228" Telescoping Boom
Will Swing 180°

WINSTON MACHINERY CO., INC.
326 WEST OHIO STREET
INDIANAPOLIS 2, IND.

AARON • NEW—USED REBUILT MACHINE TOOLS • IMMEDIATE DELIVERY

AUTOMATICS
Brown & Sharpe (1) Model #4
Brown & Sharpe (1) Model 2G, 1¼" capacity.
Brown & Sharpe (8) Model 0G, ⅜" capacity.
Brown & Sharpe (5) Model 00G, ⅜" capacity.
Brown & Sharpe #4 Automatic New 1939
Coco Screw Machine ⅜" capacity.
Cleveland Model AA-11, Serial #36586.
Cleveland Model B, Serial #42618/843.
Cleveland B1B—1½" Cap. Late.
Conomatic 4 Spindle, Serial #2309FF, 1½".

BORING MILLS
Bullard 24" V.T.L. Spiral Drive
Bullard 8"—8 spindle, Multi-Matic
Cleveland 2½" Bar Capacity
Giddings & Lewis #32, 3" #25, 2½" Bar.
Xinga 42", 72" Vertical 2 rail heads
Niles-Bement-Pond 4" 4½" Bar, 60" Vert.
Niles-Bement-Pond 60" Vertical
New 3" Horizontal Boring Mill

DRILLS AND RADIALS
American 6'x15" Universal, 4'13", 3'9"
Baker No. 321 Vertical Boring & Drill
Bausch Multi-spindle
Buffalo #2 Motor Spindle, #16—4 Sp.
Buffalo: Power No. 41, No. 42, RPMSTERS
Canedy-Otto 21" Sliding head, New
Cincinnati Bickford 6'x15" col.
Edlund 8" Model 2B, Sliding Head
Natco #12, 20 spindle. Model B2A—10 Sp.
24" Sibley Sliding head
New Geared Box Col. Drills 24"
Foote-Burt #25 3" capacity
Leland Gifford 2 LMS, 3 MS
Leland Gifford No. 2—4 Sp. Hyd. Feeds
Sigourney 2 spindle

ENGRAVERS
Gorton #ME, 1D, 3U, 3Z, Deckel G1L, G1, G2
Taylor-Hobson 3 dimensional Pantograph
New, 3 dimensional Deckel type

GEAR EQUIPMENT
Barber-Colman Mod. SHS, Sharpener
Barber-Colman #3, #2, #12 (3) also Type S.
Brown & Sharpe #3 Gear Mill, 26" Cap.
Fellows High Speed Shapers 712, 725, 71, 7
Fellows #20M Redliner, Flather 72" Cutter
Gleason Gear Rougher, Gleason #6 Power Tester
Gleason #2 Surface Hardener, No. 3 Gear Tester
Gleason #3 Spiral, #3 Straight Bevel
Gould & Eberhardt 36" Cutter
Michigan Gear Finisher 24" cap., 862-24A
Mikron No. 79 Gear Hobbers
National Broach Red Ring Lapper, Finisher
Schuchardt & Shutte #1 Hobber

GRINDERS SURFACE
New 9x24" Hyd. Feed, 10x18", 6x18"
Abrasive 8x24", #33 Vert. & #34
Brown & Sharpe #5, #2 with Chuck
Gallmeyer & Livingston—65
Heald 22—12" chuck, Arter 12", Covel No. 15
Portman 12" Chuck Rotary—Reid #3, 11"x36"
Pratt & Whitney 12x36" Vertical
Taft Pierce #1 Precision

HYDRAULIC EQUIPMENT
8 and 9 oz. Injection Moulders
125 Ton Southwark Press, Bed 96"x30". 30" stroke, 2 to 4 ft. opening
150 Ton Triple Action HPM Press
250 Ton Watson & Stillman 28x24"
300 Ton Watson & Stillman 24x29"
300 Ton Watson & Stillman 20"x20" Platen 8" St. 19" opening
600 Ton Williams & White 42"x60"
800 Ton Williams & White 42"x60"
800 Ton W&S Hobbing Press
All Hydraulic Equipment is completely engineered and checked by a competent staff thus assuring reliability.
Send us your Hydraulic problems.

GRINDERS, MISCELLANEOUS
Brown & Sharpe #2 Universal 14"x28", #3 Univ.
Brown & Sharpe #5, 3"x18" Cylindrical
Brown & Sharpe #13 Universal Tool & Cutter
Bryant #5 Internal, chucking
Cincinnati 6x18" Hyd. #4—Centerless—#2
Douglas Tool & Cutter 8"x15"
Gardner Disc Grinder 30"—15 H.P. Motor
Grenby Models 1G1 & 1G2—Internal
Gorton Ped. Type Tool Grinder Mod. 375-2
Heald #73 Internal Centerless, #75A Internal
Heald 72A3 Int. Centerless Sizematic
J. & L. Thread; TG615, Lampco 54" Swing
Landis 6"x30" Type C Cyl., 10x24 Univ. 12x30
Norton #2 Tool & Cutter, No. 1 Tool & Cutter
Norton Type C 6"x18" Semi-Automatic cyl.
Norton 10"x18" Type C cylindrical, 6"x30" Cyl.
Norton 14"x96" cyl., 16x48 Univ.
Norton Roll Grinder 50"x28'
Oliver #510 Drill Pointer
Pratt & Whitney Radius Model R6
Sellers 6-G Drill Grinder, 6G Tool, K.O. Lee tool
Van Norman #666 Crankshaft

LATHES
American 12"x30", Bridgeford 36"x20", 32"x16'
Bertram 26"x10'
Boyes & Emmes—24" G.H.—Bradford 16"x36"
Gisholt Simplimatic 18"x16½", 2 Tables
Hendey 12"x42" and 12x30", 1941, 14" Yoke
LeBlond Regal 10"x3' bed, 13x42"
LeBlond 25/50x96" Gap, Late type.
Lipe-Carbo 12"x18" (2)
Lodge & Shipley #3A, Duomatics
Pratt & Whitney 16"x60, 10"x20", 16"x36
Monarch Magna-matic 14"x54"
New 16, 18, 20", 28" Immediate Del.
New Tool Maker 10x24", South Bend 9"
Rivett Model 918 Precision. Mod. 715
Putnam, Sliding Gap 22"/46"x92"
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Kempsmith #1 Pl., Vert. & Div. Hd.
Milwaukee 2H Universal, 2H Plain
Milwaukee #2B, Plain & Univ.
Nichols Horiz. Hand and Pneumatic Feed
Sundstrand #00, 0, Rigidmils
Sundstrand #3A Rigidmil with copying Attach, 33
Van Norman #2L Univ., Dividing Head

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Stokes Tablet Presses, Mod. R, RD3, RD3S, DDS.
Toledo 29 Double Action Cam
V. & O. #102 O.B.I. Reducing
Walsh No. 3 O.B.I. 23 Ton, L1 #3
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Bardons & Oliver #2, 3, 5, 7. Bar Feed
Brown & Sharpe, #2 Hand, #10, 11
Foster #2B 2½ Cap. Morey #2G Late
Gisholt 2L, Cross Slid. Tur.
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Gisholt 4R—9¼" hole in spindle
Libby 1 HS with threading att.—3R 4R
Oster 601 WD. #2 Simmons Microspeed
Warner & Swasey #1, 1A, 2, 2A, 3, 4, 5

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Nos. 5, 16A and 2436 Bryant
72A3 Heald Gagematic and Sizematic

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8"x24" No. 5B Brown & Sharpe, late

GRINDERS, Radius
42 Van Norman

HONES
No. 172 and 2610 Barnes vert. hydr.
No. H2 Micromatic, 1941

LATHES, Eng.
14"x42" Hendey, late
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LATHE, Mfg.
20"x25" Fay automatic, 1942
No. 6 LeBlond Multi-Cut, 1941
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INDEX OF PRODUCTS ADVERTISED IN THIS ISSUE

Abrasives, Coated 56-57, 202, 222

Accessories & Attachments (Machine Tool) 91-95, 226, 229, 238, 248, 260, 268, 287

Balancing Machines 32D, 258

Bearings ..... 4th Cover, 241

Bending Machines 208

Books, Technical 238

Boring, Drilling & Milling Machines (Horizontal) 14-15, 289

Boring Machines Internal ..... 2nd Cover

Boring & Turning Machines (Vertical) 289

Broaching Machines 38

Brushes 243

Cams 246

Castings 200, 216

Centrifugal Machines 246

Chucks 237, 248, 265, 266

Cleaning & Drying Machines & Supplies 244

Collets 54

Controls Electrical 88-89

Coolant Systems, Filters & Supplies 65

Cutters, Abrasive 201

Diamond Wheels 232

Die Sets 62

Disintegraters, Metal 154, 240

Dressers 94-95

Drilling Machines 26-27, 28, 43, 51, 75, 85, 106, 181, 213, 220, 235, 246

Drill Jig Bushings 98, 256

Duplicators & Pantographs ..... 3rd Cover, 79, 193

Electro Plating & Polishing Equipment & Supplies 210

Engineering & Production Services 91

Fabricating Methods & Services 238

Fasteners 44, 191, 256, 288

Floor Drying Compounds 224

Forgings 221

Gages & Instruments 16, 42, 58, 70-71, 206, 218, 223, 246, 250, 260, 265, 266, 268, 284

Gear Cutting Machines 3, 6-7, 35, 86, 197, 252

Gears, Speed Reducer, Motor Reducers 197, 212, 225, 242, 250, 252, 284

Gear Testers 3, 6-7

Grinders—Cutter & Tool 12-13, 34, 45, 90, 286, 290

Grinding Machines—Production ..... 2nd Cover, 8-9, 12-13, 18-19, 29, 34, 63, 64, 92, 242, 290

Grinding Wheels 18-19, 56-57, 192, 207, 215, 228

Heads: Drilling, Grinding & Tapping 110, 256, 258, 289

Heat Treating Equipment & Supplies 68, 72-73, 198, 251, 287

Honing Machines 100, 246, 253

Hydraulic & Pneumatic Parts & Equipment 227

Jig Borers 262

Lathes, Automatic 32, 32D, 49

Lathes, Engine ..... 3rd Cover, 60-61, Insert Bet. 64 & 65, 69, 79, 87, 109, 187, 247, 261, 263, 270

Lathes, Turret 22-23, 32D

Lubricants, Cutting Fuids, Quenching Oils & Solvents 40-41, 52-53, 55, 77, 158, 204, 267

Lubricating Systems & Equipment 84, 209

Machines, Super Finishing 32D

Marking Machines, Tools & Supplies 268

Materials, Cutting & Forming 80-81, 84, 104-105, 160, 185, 195, 199, 203, 226, 230-231, 249, 269

Materials of Manufacture 160, 179

Materials Handling Equipment 205

Millers, Die Sinkers, Profilers 4-5, 20-21, 74, 76, 189, 193, 245, 254, 258, 262

Oil Purifiers 246

Planers 14-15, 102

Power Transmission 17

Presses, Forging & Forming Equipment & Supplies 33, 53, 62, 96, 194, 208, 238, 248, 258, 262, 286

Production, Inventory & Tool Control 196

Pumps, Circulating 263

Riveting Machines 252

Rust Preventives 257

Safety & Welfare Equipment 259, 260

Saw Blades 80-81, 82, 199, 236, 260

Sawing Machines 82, 153, 236, 256

Screwdriving Machines 285

Screw Machines; Chucking Machines 39, 46, 190

Shapers, Slotters, Keyseaters 30-31, 112, 248, 250, 258, 260, 270

Special Machine Tools 38, 91, 153, 213

Stampings 268

Swaging Machines 234

Tapping Attachments 156

Tapping Machines 51, 213, 220

Thread Cutting Machines 10-11

Thread Rolling Machines & Tools 211

Tools, Cutting ..... 24-25, Insert Following P. 32, 36-37, 38, 45, 47, 78, 83, 93, 104-105, 217, 219, 233, 246, 258, 260, 263, 268, 286, 288

Tools, Hand 48, 221

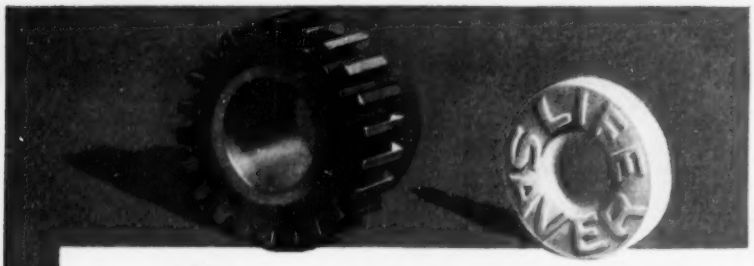
Tools, Measuring 256

Tools, Portable 183, 242

Used & Surplus Equipment 271-282

Vises 94-95, 229, 234, 287

Welding & Cutting, Brazing & Soldering Equipment & Supplies 255



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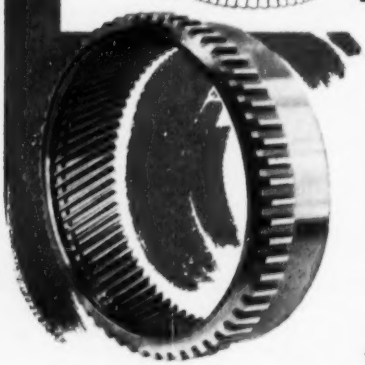

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INDEX TO ADVERTISERS

This index is published as a convenience to the readers. Every care is taken to make it accurate, but AMERICAN MACHINIST assumes no responsibility for errors or omissions.

	Page
Abrasive Products Inc.	222
Acme Gear Co.	252
Acme Industrial Company	256
Acromark Company	268
Acrament Gage Div. of Myer Corp.	266
Affiliated Machine & Tool Co.	260
Allegheny-Ludlum Steel Corp.	269
American Brass Company	179
American Broach & Machine Co.	38
American Chain & Cable Co., Inc.	268
American Machinist	66-67
American Optical Co.	259
American Steel Foundries, Elmes Engineering Div.	96
American Tool Works	43
Ames Company, B. C.	217
Armcur & Co. & Subsidiaries	202
Armstrong-Blum Mfg. Co.	82
Armstrong Bros. Tool Co.	48
Atlantic Abrasive Corp.	207
Austin Industrial Corp.	74, 260
Avey Drilling Machine Co.	106
Baker Bros., Inc	213
Baldwin Lima Hamilton Corp.	200
Barrett Co., Leon J.	246
Bath Co. Inc., John	233
Bellows Co.	227
Besley-Wells Corporation	263
Bethlehem Steel Co.	185
Bijur Lubricating Corp.	209
Bilgram Gear & Machine Co.	252
Black & Decker Mfg. Co.	183
Blake Co., Edward	286
Blanchard Machine Co.	64
Bliss Co., E. W.	33
Brown & Sharpe Mfg. Co.	58
Bryant Machinery & Engineering Co.	75
Bullard Co.	35, 46
Butterfield Div. of Union Twist Drill Co. Insert following	32
Capewell Mfg. Co.	199
Carboloy Dept. of General Electric Co.	104-105
Carborundum Co.	56-57
Cardinal Machine Co.	234
Card Mfg. Co., S. W. Insert following	32

INDEX TO ADVERTISERS

	Page
Carroll & Jamieson Machine Tool Co.	270
Carter Products Co. Inc.	226
Cavalier Gage Company	250
Chandler Tool Co.	258
Chicago Wheel & Mfg. Co.	228
Cincinnati-Bickford Tool Co.	85
Cincinnati Gear Co.	250
Cincinnati Lathe & Tool Co. Insert Bet.	64 & 65
Cincinnati Milling Machine Co.	4-5
Cincinnati Planer Company	14-15
Cincinnati Shaper Co.	30-31, 112
Cleereman Machine Tool Co.	75
Clinton Machine Co.	154
Columbia-Geneva Steel Div.	84
Columbia Tool Steel Co.	226
Columbus Die-Tool & Machine Co.	238
Comet Tool Co.	286
Cone Automatic Machine Co.	59
Covel Manufacturing Co.	34
Crucible Steel Co. of America	195
Davis Boring Tool Div. Giddings & Lewis Machine Tool Co.	78
Davis & Thompson Co.	289
Davis Keyseater Co.	258
Delpark Industrial Filtration	65
Delta Power Tool Div. Rockwell Mfg. Co. Drill Head Unit	235
Detroit Milling Cutter Co.	246
Disston & Sons Inc., Henry	249
DuPont de Nemours & Co., Inc., E. I. Electrochemicals Dept.	267
Eastern Machine Screw Corp.	256
Eisler Engineering Co., Inc.	246
Elastic-Stop Nut Corp.	191
Elmes Engineering Div. American Steel Foundries	96
Elox Corporation of Michigan	240
Erickson Tool Company	266
Ex-Cell-O Corporation	98
Falk Corp.	225
Federal Products Corp.	70-71
Fellows Gear Shaper Co.	6-7
Felters Co.	224
Ford Mfg. Co., M. A.	260
Fosdick Machine Tool Co.	26-27
Gallmeyer & Livingston Co.	290
Gardner Machine Co.	29
Giddings & Lewis Machine Tool Co.	14-15

(Continued on page 286)

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INDEX TO ADVERTISERS

(Continued from page 285)

	Page
Gisholt Machine Co.	32D
Gleason Works	3
Gorham Tool Co.	93
Gorton Machine Co., George	245
Goss & de Leeuw Machine Co.	193
Grant Gear Works Inc.	242
Grant Mfg. & Machine Co.	252
Gray Co., G. A.	102
Greaves Machine Tool Co.	284
Grob Brothers	256
Gulf Oil Corp.	40-41
Hanson-Whitney Div. Whitney Chain Co.	219
Hardinge Brothers, Inc.	54
Heald Machine Co.	2nd Cover
Heller Machine Co.	76
Henry & Wright Div. Emhart Mfg. Co.	50, 258
Holcroft & Co.	198
Hones, Inc., Charles A.	287
Hy-Pro Tool Co.	217
Hyster Company	205
Illinois Gear & Machine Co.	197
Industrial Filtration Co.	65
J. & L. Machinery & Supply Co.	286
J & S Tool Company	94-95
Jacobs Mfg. Co.	237
James Mfg. Co., D. O.	212
Johnson & Bassett Inc.	268
Jones & Lamson Machine Co.	32, 42
Kearney & Trecker Corp.	20-21, 91
Kempsmith Machine Co.	229
Landis Machine Co.	10-11
Landis Tool Co.	12-13
Latrobe Steel Co.	203
LeBlond Machine Tool Co., R. K.	60-61
Lees-Bradner Co.	86
Lehmann Machine Co.	261
Leland-Gifford Co.	181
Lewthwaite Machine Co., T. H.	248
Lindberg Steel Treating Co.	68
Linde Air Products Div. Union Carbide and Carbon Corp.	255
Link-Belt Co.	17
Linley Brothers Co.	262
Lodge & Shipley Co.	87
Luers, J. Milton	260

INDEX TO ADVERTISERS

	Page
Macklin Company	201
M.B.I. Export & Import Ltd.	69, 287
McCaskey Register Co.	196
McGraw-Hill Book Co., Inc.	238
Metalmaster Div. Clinton Machine Co.	154
Micromatic Hone Corp.	100
Millers Falls Company	285
Mitts & Merrill	248
Moline Tool Co.	246
Monarch Machine Tool Co.	79
Morris Machine Tool Co.	28
Morse Twist Drill & Machine Co.	24-25
Motch & Merryweather Machinery Co.	153
Murchey Machine & Tool Company	110
National Acme Co.	39
National Automatic Tool Co.	51
National Machine Tool Co.	270
National Malleable & Steel Castings Co.	216
National Tool Co.	47
National Twist Drill & Tool Co.	37
Nebel Machine Tool Co.	109
New Britain Machine Co.	3rd Cover
Nilson Machine Co., A. H.	262
Norton Co.	18-19
Oakite Products Inc.	244
Oliver Instrument Co.	90
Onsrud Machine Works Inc.	189
Orban Inc., Kurt	250
Osborn Mfg. Co.	243
Ottemiller Co., Wm. H.	288
Parker Machine Co., Inc.	258, 264
Parker Rust Proof Co.	257
Potter & Johnston Co. Sub. Pratt & Whitney Div. Niles-Bement-Pond Co.	49
Pratt & Whitney Div. Niles-Bement-Pond Co.	45, 206
Ransburg Electro-Coating Corp.	210
Reed-Prentice Corp.	254
Reed Rolled Thread Die Co.	211
Reid Brothers Co. Inc.	92
Rico Supply Co.	268
Rotex Punch Company Inc.	262
Ruthman Machinery Co.	264
Ryerson & Sons Inc., Joseph T.	160
S. K. F. Industries Inc.	241
Sales Service Machine Tool Co.	194

(Continued on page 288)

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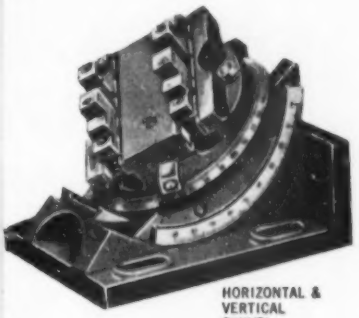

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SIZE	THREAD
4	32-40-48-64
5	30-32-36-40-48
6	30-40-48-56-60
7	32-48
8	24-30-36-38-40-44-48
9	24-28-32-40
10	28-30-36-40-48-64
12	28-28-32-36
14	20-24-28
1/16	60-64
5/64	72
3/32	48
7/64	48-56
1/8	32-40
5/32	32-36-40
9/64	36-40
11/64	36
3/16	20-24-32
13/64	32
7/32	24-28-32
1/4	16-24-30-32-36-40
5/16	18-20-22-27-28-32-40

SIZE	THREAD
3/8	12-16-18-20-27-28-32-36-40-48
7/16	12-16-18-22-24-27-28-30-32-36-40
1/2	12-14-16-18-22-24-26-27-28-30-32-40
9/16	16-20-24-27-28-30-32-40-48
5/8	12-14-16-20-24-27-28-32-36-40
11/16	11-16-18-20-24-27-28-30-32
3/4	9-11-12-14-16-20-24-26-27-28-32
13/16	10-14-16-20-32
7/8	10-12-16-18-20-24-27-28-32
15/16	8-9-10-12-14-16-18-20-24-32
1	10-12-14-16-20-24-27-32-40
1-1/16	12-14-16-18-20-24
1-1/8	8-10-14-16-18-20-24-32
1-3/16	8-10-12-14-16-18-20-24
1-1/4	8-10-14-16-18-20-24-32
1-5/16	12-14-16-18-20-24-32
1-3/8	8-10-14-16-18-20-24
1-7/16	8-10-12-16-18-20-24
1-1/2	8-10-14-16-18-20-24-28
1-9/16	16-20-24
1-5/8	5-1/2-8-10-12-13-16-20-24
1-11/16	10-12-14-16-18-20-24

SIZE	THREAD
1-3/4	8-10-12-14-16-18-20-24
1-13/16	8-10-12-14-16-18-20
1-7/8	8-10-12-14-16-18-20-24
1-15/16	8-10-12-14-16-18-20-24-28
2	4-1/2-8-10-12-16-18-20
2-1/16	12-14
2-1/8	12-16-20
2-3/16	12-36
2-1/4	4-1/2-8-12-14-16-18
2-5/16	12-18
2-3/8	12-16-18
2-1/2	8-10-12
2-9/16	18
2-5/8	12-16-20
2-3/4	16
2-7/8	8-12-16
3	8-16
3-1/4	8-12-16
3-1/2	8-12-16
3-7/8	8
4	8-12

HIGH SPEED LEFT HAND TAPS

SIZE	THREAD
0	80
1	56-64-72
2	56-64
3	56
4	32-36-40-48
5	40-44
6	32-36-40
8	32-36-40
10	24-30-32-40
12	24-28-32
1/4	20-28-32
5/16	18-20-24-28-32

SIZE	THREAD
3/8	16-24-32
7/16	14-20-28
1/2	12-13-20-28
9/16	12-18-20-24
5/8	11-12-16-20-24
11/16	11-16-24
3/4	10-16-18-28
13/16	16
7/8	9-12-14-18-20
1	8-12-14-16-18-20
1-1/8	7-12
1-1/4	7-12-16-18

SIZE	THREAD
1-3/8	6-8-10-12-16-18-20-24
1-7/16	8-10-12-14-16-18-20
1-1/2	6-8-10-12-16-18-20
1-9/16	8-10-12-16-18-20
1-5/8	8-10-12-14-16-18-20
1-11/16	8-10-12-14-16-18-20
1-3/4	8-10-12-14-16-18-20
1-13/16	8-10-12-14-16-18-20
1-7/8	8-10-12-14-16-18-20
1-15/16	8-10-12-14-16-18-20
2	4-1/2-10-12

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INDEX TO ADVERTISERS

(*Continued from page 287*)

	Page
Schenck, Carl, Maschinenfabrik	258
Scherr Co. Inc., George	246, 256, 258, 260
Shear Speed Chemical Products Div. Michigan Tool Co.	55
Sheffield Corp.	110
Shore Instrument & Mfg. Co. Inc.	284
Sid Tool Company	288
Sidney Machine Tool Co.	187
Simonds Abrasive Co.	192
Simonds Saw & Steel Co.	80-81
Snow Mfg. Co.	220
South Bend Lathe Works	247
Standard Oil Co. (Indiana)	52-53
Standard Pressed Steel Co.	44
Standard Tool Co.	83
Sterling Abrasives Div. Cleveland Quarries Co.	214-215
Strong, Carlisle & Hammond Co.	256
Sunbeam Corp.	251
Sunnen Products Co.	253
Sun Oil Co.	158
Swiss Instrument Sales Co.	223
Taft-Peirce Mfg. Co.	265
Tennessee Coal & Iron Div.	84
Thompson Grinder Co.	63
Thompson & Son Co., Henry G.	236
Tide Water Associated Oil Co.	77
Timken Roller Bearing Co.	4th Cover
Torrington Co.	234
Turchan Follower Machine Co.	193
Union Carbide & Carbon Corp.	255
Union Drawn Steel Div. Republic Steel Corp.	230-231
Union Twist Drill Co. Insert following	32
U. S. Diamond Wheel Co.	232
U. S. Electrical Tool Div. Emerson Electric Mfg. Co.	242
United States Steel Corp.	84
United States Steel Export Co.	84
United States Steel Supply Div.	84
U. S. Tool Co. Inc.	62
Utica Drop Forge & Tool Corp.	221
V & O Press Co. Div. Emhart Mfg. Co.	268
Vaill Engineering Co.	289
Van Keuren Co.	16
Van Norman Co.	8-9

INDEX TO ADVERTISERS

	Page
Wade Tool Co.	239
Walker Co. Inc., O. S.	248
Waltham Machine Works	252
Warner & Swasey Co.	22-23
Westinghouse Electric Corp.	72-73, 88-89
White & Bagley Co.	204
Wickman Manufacturing Co.	156
Wilson Mechanical Instrument Co.	268
Winter Brothers Co.	38
Wolverine Tool Co.	248
Worcester Gear Works Inc.	250
Wysong & Miles Co.	208
Zeh & Hahnemann Company	248

SEARCHLIGHT SECTION

(Classified Advertising)

H. E. Hilty, Mgr.

	Page
EMPLOYMENT	
Positions Vacant	270
Positions Wanted	270
Employment Services	270
SPECIAL SERVICES	
Contract Work	271
Eastern Machine Screw Corp.	271
General Pattern Works	271
Rebuilding	278
BUSINESS OPPORTUNITIES	
Offered	271
NOTICES	
Legal	270
EQUIPMENT	
(Used or Surplus New)	
For Sale	271-282
WANTED	
Equipment	271

ADVERTISERS INDEX

Aaron Machinery Co., Inc.	281
American Metal Specialties Corp.	278
Behr & Sons Inc., Joseph	280
Bennett Machinery Corp.	272
Boice Crane Co.	271
Botwinik Bros. of Mass., Inc.	282
Brownell Machine Tools Inc., Hazard	281
Cincinnati Machinery Co.	274
Cox Machinery Co., Inc.	276
Currier Machine Sales	272
Dayton Pump & Manufacturing Co.	271
DeWitt Equipment Co.	278
Dony Machinery Co., D. E.	271
Eastern Machinery Co.	277
Falk Machinery Co.	273
Heinz, Johnson, Dunn Corp.	271
Hill-Clarke Machinery Co.	279
Hyman & Sons, Joseph	272
Indianapolis Machinery & Supply Co.	276
Laurens Bros. Inc.	280
MacDell Corporation	272
Miles Machinery Co.	282
Morey Machinery Co.	274
National Machinery Exchange	274
O'Brien, Clarence J.	278
O'Connell Machinery Co.	282
O'Shea Employment System	270
Peacock Corp.	271
Power Press Specialists	274
Reid Co., Edward C.	281
Triplex Machine Tool Corp.	275
United Machinery & Tool Corp.	271
Victor Machinery Co.	272
Wigglesworth Industrial Corp.	276
Williams, Edward, Hale	282
Williams Machinery Co.	271
Winston Machinery Co., Inc.	271, 276, 280, 282
Worcester Automatic Rebuilding Co.	278

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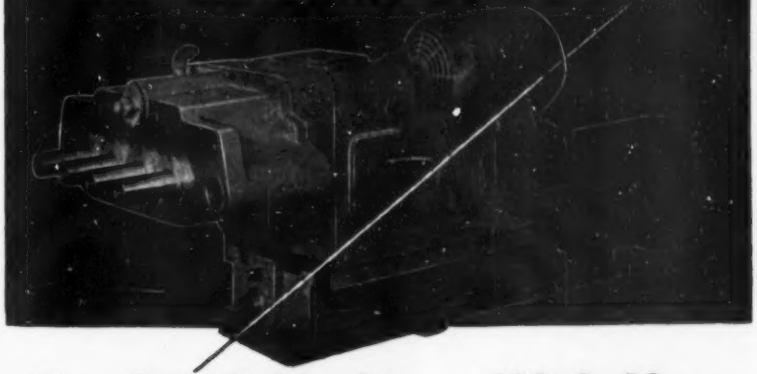
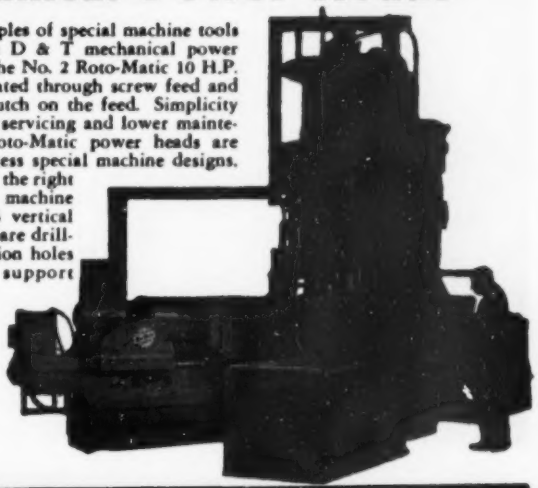


Use D&T Machines With New Mechanical Power Heads

Here are two good examples of special machine tools designed and built with D & T mechanical power heads. Shown above, is the No. 2 Roto-Matic 10 H.P. head. All sizes are operated through screw feed and have overload release clutch on the feed. Simplicity of design makes for less servicing and lower maintenance costs. D & T Roto-Matic power heads are readily adapted to countless special machine designs. For instance: Machine to the right is a 6 station indexing machine with 3 horizontal and 3 vertical power heads. Operations are drilling and reaming suspension holes and king pin holes in support arms for power heads.



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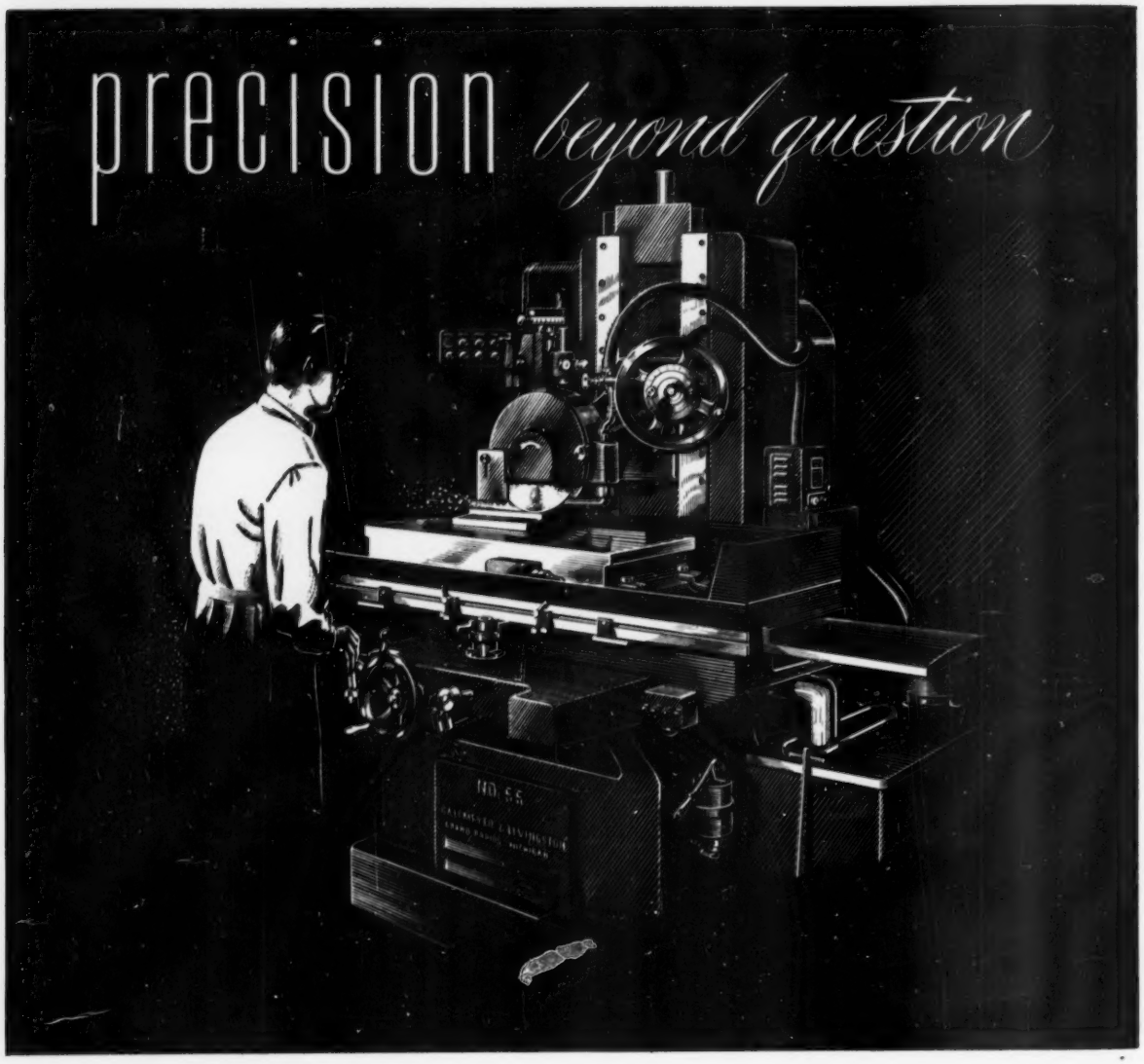

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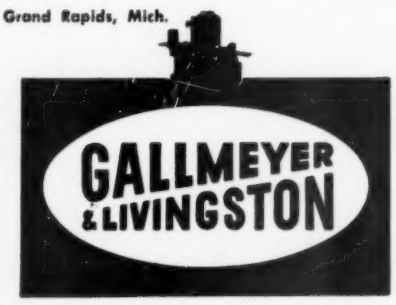

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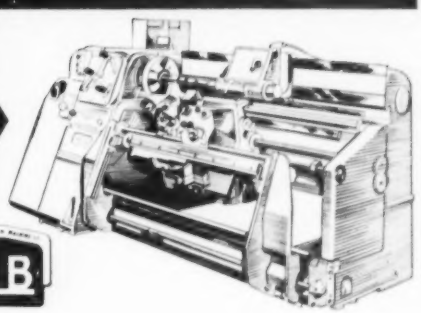


Gets greater accuracy in heavy duty threading... *with spindle on TIMKEN® bearings*

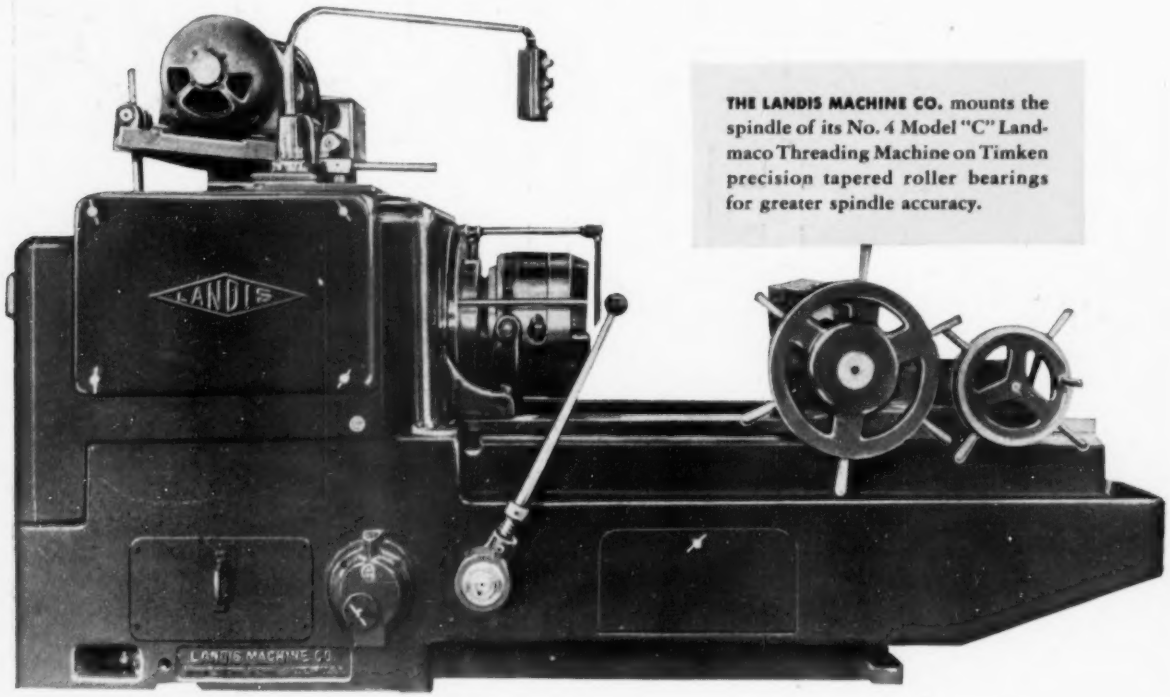
THE Landis Machine Company designed their No. 4 Model "C" Landmaco Threading Machine for heavy duty precision threading on large diameter work. To make sure it delivers that precision, Landis engineers mount the spindle on Timken® precision tapered roller bearings.

Designed for spindle applications, these Timken bearings maintain spindle precision and accurate gear mesh no matter how heavy the load. Timken roller bearings are tapered in construction to take radial, thrust and combination loads. Line contact between rollers and races provides maximum capacity. Shafts are held in rigid alignment. Proper gear meshing is assured. Shaft wear is eliminated, gear wear reduced.

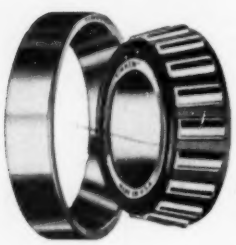
Timken bearings normally last the life of the machine because they're engineered for the job, precision manufactured and made of special analysis Timken fine alloy steel.

For over 25 years, Timken bearings have contributed to the development of precision machine tools. Be sure you have them in the machine tools you build or buy. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



THE LANDIS MACHINE CO. mounts the spindle of its No. 4 Model "C" Landmaco Threading Machine on Timken precision tapered roller bearings for greater spindle accuracy.



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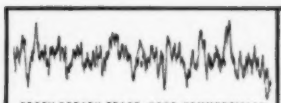
TAPERED ROLLER BEARINGS



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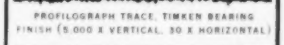

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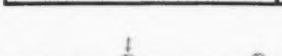

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